Technical Service Manual
PM2200 Series Liquid Oxygen Portable

EASYMATE
Liquid Oxygen System

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PREFACE

Customer Service / Tech Support
Phone:
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This manual is intended to guide and help a qualified service technician in the safe handling, service, repair and calibration of the EasyMate PM2200 Series Portable Liquid Oxygen System. A qualified service technician should be trained in the safe handling of liquid oxygen and understand its inherent dangers. All qualified technicians must have completed the XXXXXXXXXXXX PM2200 Series Liquid Oxygen System Technical Service Training Program. Only those facilities with individuals who have completed this program will be eligible to purchase the required test equipment and the components need to complete repairs.

DO NOT attempt to use or perform any service function on the EasyMate PM2200 Series Portable Liquid Oxygen System unless you have read and understand this manual as well as the User Manual.

DEFINITION OF TERMS

LOX	Liquid Oxygen
GOX	Gaseous Oxygen
NER	Normal Evaporation Rate
VTF	Vent-to-fill
OVP	Operation Verification Procedure
AOVP	Advanced Operation Verification Procedure

SAFETY INFORMATION - WARNINGS AND CAUTIONS

⚠DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTE: Labels on Portable in photos may vary.

THEORY OF OPERATION

The EasyMate Portable is intended to provide supplemental oxygen to the ambulatory oxygen patient in the smallest lightest package possible. Utilizing XXXXXXXXXXXX patented Oxygen Conserving Technology the EasyMate Portable is an all pneumatic device requiring no batteries or electrical power source of any kind.

This pneumatic oxygen conserving technology delivers a true “pulse” of oxygen within the first 1/3 of the patients inspiration breath and is unique in several additional ways. A true “pulse” is defined by a high peak flow (4 to 10 LPM) for a very short duration of time (0.2 to 0.4 seconds). It also controls the delivered minute volume which remains consistent between 15 and 35 BPM. The total oxygen volume (delivered minute volume) the patient receives is always the same, as the patient’s breath rate decreases the pulse volume increases and conversely when breath rate increases.

The GOX flows and accumulates in the conserver’s reservoir housed in the dome at a rate defined by the pulse selector setting. The conserver senses the patient’s inspiratory effort by means of a thin membrane. The membrane opens a slave valve and in turn releases the contents of the reservoir to the patient. This all happens in less then 0.5 seconds. The delivered minute volume is controlled by the setting, the volume of the reservoir and the time between breaths.

The cryogenic container is another unique feature of the EasyMate Portable. It is the first and only truly no spill container. This is achieved by the use of a simple dip tube extending to the center of the container. Constructed like a stationary Reservoir it is very durable and can stand up to the toughest patient use. The method to convert LOX to GOX is also a very unique feature of the EasyMate Portable. There are no warming coils, economizer valves, tubing or tubing connections of any kind on the exterior. The LOX is converted to GOX by means of the container’s NER and its patented thermal probe technology. The thermal probe operates on the head pressure within the container. As the pressure decreases the thermal probe engages and transfers heat energy from the dome via the probe into the LOX. The LOX boils off, changes to GOX which expands, increasing the pressure in the container and disengaging the probe. The EasyMate Portable’s NER is slightly higher then the delivered minute volume on setting 1 and approximately the same as setting 2. Therefore the probe is idle on setting 1 and 2. The probe operates mostly on setting 3 and 4 and also just after filling to build head pressure in about 1 - 3 minutes the EasyMate Portable achieves full head pressure.

WARNINGS AND CAUTIONS

⚠WARNING

- **Oxygen supplied from this device is for supplemental use and is not intended to be life supporting or life sustaining. This device is not intended for use by patients who would suffer immediate, permanent, or serious health consequences as a result of an interruption in the oxygen supply.**
- Always follow CGA P-2.7 standard, (Guide for the safe storage, handling, and use of Portable Liquid Oxygen Systems in Health Care Facilities).
- This device is NOT to be used by patients who breathe through their mouths.
- **DO NOT** smoke in an area where oxygen is being administered.
- **DO NOT** use near any type of flame or flammable/explosive substances, vapors or atmosphere.
- **DO NOT** use oils, greases, lubricants or any combustible materials on or near this product. Wash hands properly prior to usage.
- **DO NOT** touch liquid oxygen or parts that have been in contact with liquid oxygen. Liquid oxygen is extremely cold (-297°F/-183°C). When touched, liquid oxygen, or parts of the equipment that have been carrying liquid oxygen, can freeze skin and body tissue.
- **DO NOT** connect the Portable System to a gas source other than Oxygen. Doing this may cause inhalation of hazardous substances.

⚠WARNING

TO AVOID INCREASED RISK OF FIRE

- Keep this equipment away from electrical appliances. Use and store Reservoir and Portable units at least five (5) feet from electrical appliances that may cause heat or sparks.
- Keep oxygen equipment away from open flames. Use and store Reservoir and Portable at least five (5) feet away from equipment such as furnaces, water heaters, and stoves that may contain open flames.
- **Keep equipment in a well-ventilated area at all times.** These devices periodically release small amounts of oxygen gas that must be ventilated to prevent buildup.
- High concentrations of oxygen can cause rapid burning of other substances.
- **DO NOT** store liquid oxygen equipment in a closet, car trunk, or other confined area.
- **DO NOT** place blankets, draperies, or other fabrics over equipment.
- **DO NOT** use if dirt or contaminants are present on or around fill connectors on the Portable device or Reservoir.
- **NO OXYGEN** is delivered when the Pulse Selector is at the “0” Setting.
- **NO OXYGEN** is delivered in between settings.
- **DO NOT** use while sleeping without consulting your Equipment provider.
- Prior to servicing (or packaging and shipping the PM2200 Series Portable Oxygen System for service) all oxygen must be depleted.
- To deplete oxygen from the PM2200 Series Portable Oxygen System, prop open Vent Lever using black O-ring provided. (Slip the Black O-ring over Vent Lever and slide towards device).
- When opening the Vent Lever to release pressure, point the Fill Connector in a safe direction.
- Place in a well ventilated area away from sources of ignition when allowing to deplete.
- **DO NOT** point discharging oxygen toward anyone or flammable material.
- **DO NOT** attempt to adjust the pressure setting of the pressure relief valve; it has been pre-set at the factory.

⚠CAUTION

- This device is designed to operate with a single lumen, adult, nasal cannula with a maximum length of 7 feet or less.
- Only individuals instructed and trained in its use should operate this device.
- Inspiratory efforts vary from patient to patient. The Portable Liquid Oxygen System may not be able to detect respiratory efforts of all patients.
- This device contains magnetic, ferrous material that may affect the results of an MRI.
- **DO NOT** use liquid leak detector to test for leaks.
- **DO NOT** autoclave.
- **DO NOT** gas sterilize.
- **DO NOT** clean with aromatic hydrocarbons.
- **DO NOT** immerse device in any kind of liquid.
- Avoid dropping the device or placing it in a position where it could fall and become damaged.
- **DO NOT** block the outlet fitting or kink the cannula tubing when the device is in use.
- Store device in a clean area when not in use.
- Only use XXXXXXXXXXXXX Liquid System carrying bag.

PRODUCT SPECIFICATIONS

Model Series	PM2200 Series Portable Liquid Oxygen System “EasyMate Portable”
Models	PM2200, PM2200EN, PM2200FR, PM2200DE, PM2200ES (With Puritan - Bennett/Tyco Fill Connector) PM2201 (With Union Carbide Fill Connector “Mark Series” Fill Connector) PM2202 (With Caire/Chart Fill Connector) PM2203 (With Taema/Cryopal Fill Connector for European market)

Dimensions and Weights

Weight Empty	2.9 lbs	(1.32 kg)
Weight Full	3.6 lbs	(1.63 kg)
Weight full with all accessories	4.6 lbs	(2.09 kg)
Length	4.81 in.	(12.2 cm)
Width	3.63 in.	(9.2 cm)
Height	8.19 in.	(10.8 cm)

Operating Conditions

Temperature	40 °F to 110 °F (4.4 °C to 43.3 °C)
Altitude	500 ft (152 m) below to 10,000 ft (3048 m) above sea level

Storage Conditions

Temperature	-10 °F to 140 °F (-23 °C to 60 °C)
Humidity	95% Noncondensing
Pulse settings	1,2,3,4 LPM Equivalent
Cannula Requirements	Maximum 7 foot long standard or high flow adult single lumen nasal cannula

Capacities and Rates:

Liquid Oxygen (LOX)	0.32 Liters (10.8 oz.)
Gaseous Oxygen	277 Liters
Operating Pressure	50 psi (3.45 bar) nominal
Normal Evaporation Rate (NER)	1.53 oz per hour (0.0956 lbs/hour) (43.38 grams/hour) or 0.55 LPM or less in upright position.
Fill Pressure	Up to 60 psi
Fill time	10 to 30 seconds

SERVICE EQUIPMENT REQUIRED

Hand Tools:

- 15/16 in. x 3/4 in. thin flat open end wrench .... P/N 504715
- 7/8 in. thin flat open end wrench .... P/N 504722
- Driver bit, screw, tamper proof .... P/N 505386
- Socket, pressure relief valve .... P/N 504498
- Lip seal insertion tool .... P/N 504578
- 1/16 in. hex key (Allen wrench)
- 5/64 in. hex key (Allen wrench)
- 3/32 in. hex key (Allen wrench)
- 1/8 in. hex key (Allen wrench)
- 9/64 in. hex key (Allen wrench)
- 5/16 in. hex key (Allen wrench)
- # 1 Phillips screw driver
- 1/4 - 32 tap
- 1/2 in. nut driver
- O-ring between 1 in. - 2 in. in diameter (used as Vent Lever prop tool)
- Dental pick or small awl
- Operation Verification Procedure .... P/N 504579
- EasyMate Portable User manual (model specific) .... P/N 504635

Supplies: Loctite® 222MS low strength thread locking compound Alcohol for cleaning

Test Equipment:
XXXXXXXXXXXXX Patient Trigger Simulator Model CTS
XXXXXXXXXXXXX Probe/Pressure Test Fixture Model LS-44
XXXXXXXXXXXXX Probe Holding Fixture Model LS-45

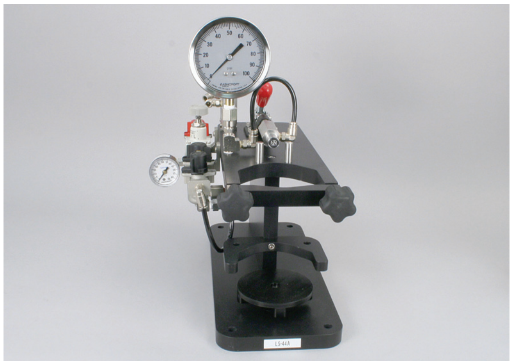


Figure 1, Probe Holding Fixture Model LS-44

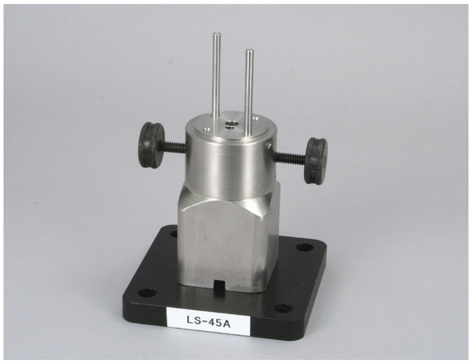


Figure 2, Probe/Pressure Fixture Model LS-45

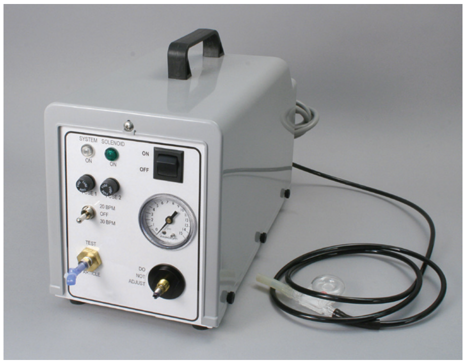


Figure 3, Patient Trigger Simulator, Model CTS

TROUBLESHOOTING

Problem	Probable Cause	Remedy
1. Will not Pulse	a. Unit empty b. Pulse Selector set to "O" c. Pulse Selector set between settings d. Unit will not trigger due to connection problem e. Unit overfilled (frozen) f. Sensitivity out of adjustment g. Conserver failure h. Defective Probe Assembly	a. Refill unit b. Set to a pulse setting c. Rotate Pulse Selector to a setting d. •Check position of cannula, ensure proper connection. OR •Check connection to CTS, ensure proper connection e. Set to "0", wait about 15 minutes f. Adjust sensitivity as per **27.0** g. Replace conserver sub-assembly as per **10.0** h. Test probe and replace as necessary as per **14.0 - 15.0**
2. Will not fill	a. VTF valve not open b. Fill connector not engaged properly c. Reservoir empty d. Damaged fill connector poppet	a. Open VTF valve b. Connect fill connector properly c. Fill reservoir d. Replace as per **20.0 - 21.0**
3. Will not disconnect after filling	a. Moisture on fill connector has frozen EasyMate Portable to Reservoir	a. •Depress release on reservoir if equipped •Allow time to thaw and release
4. Reduced use time	a. Unit not filled completely b. Not used soon after filling c. Defective Pressure Relief Valve d. Leaking VTF Valve e. Leaking fill connector poppet f. Defective Probe Diaphragm g. Defective Probe Assembly h. High NER	a. Ensure complete fill b. Use time starts when unit is filled c. Test and replace as necessary as per **22.0** d. Test and replace as necessary as per **24.0** e. Test and replace as necessary as per **23.0** f. Test and replace as necessary as per **13.0** g. Test and replace as necessary as per **14.0 - 15.0** h. Test and replace as necessary as per **26.0**
5. Auto Pulsing	a. Overfilled b. Defective Pressure Relief Valve c. Sensitivity out of adjustment d. Defective Conserver Sub-Assembly	a. Allow unit to thaw on setting "O" for 15 minutes b. Test and replace as necessary as per **22.0** c. Adjust sensitivity as per **27.0** d. Test and replace as necessary as per **28.0**
6. Constant venting	a. Once filled, unit will vent if not used b. Defective Pressure Relief Valve c. Defective Probe Assembly	a. Run on CTS on setting 3 or above b. Test and replace as necessary as per **22.0** c. Test and replace as necessary as per **14.0 - 15.0**
7. Excessive venting	a. High NER	a. Test and replace as necessary as per **26.0**
8. Leaks LOX from fill connector during filling	a. Frost or ice on fill connector b. Defective / damaged lip seal	a. Allow fill connector to thaw, dry and then retry b. Replace lip seal as per **20.0 -21.0**
9. Leaks LOX from fill connector poppet, after filling	a. Frost or ice in fill connector poppet b. Defective / contaminated poppet	a. Allow fill connector to thaw, dry and retest b. Replace poppet as per **20.0 - 21.0**
10. Leaks GOX from fill connector	a. Frost or ice in fill connector poppet b. Defective / contaminated poppet	a. Allow fill connector to thaw, dry and retest b. Replace poppet as per **20.0 - 21.0**

REMOVAL, INSTALLATION, REPAIR AND REPLACEMENT INSTRUCTIONS

Section 1.0 Dome Cap removal/installation, refer to figure 4

Removal

1.1. Remove Dome Cap by prying off the Dome Retaining Screws.

Installation

1.2 Install Dome Cap by aligning with Dome Retaining Screw and snap into place.

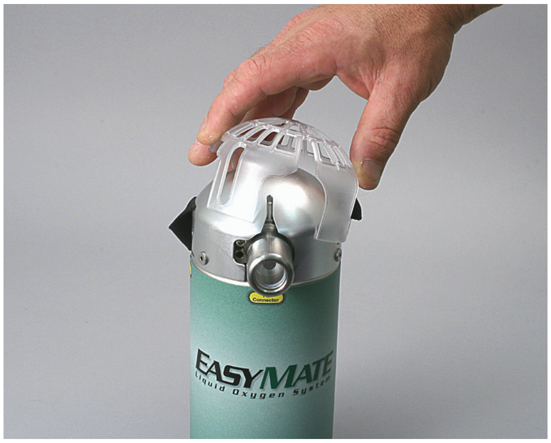


Figure 4

Section 2.0 Outlet Fitting removal/installation, refer to figure 5 & 6

Removal

2.1 Prop open the Vent Lever with the black O-ring tool. This will keep pressure from building while removing other components if there is any residual LOX in the container.

⚠CAUTION
When opening Vent Lever to release pressure from the EasyMate Portable always point the Vent Tube in a safe direction. DO NOT point discharging oxygen toward anyone or flammable material.

2.2 Remove Outlet fitting Retaining Screw.
2.3 Remove Outlet Fitting by pulling straight out.

Installation

2.4 Install the Outlet Fitting by inserting into position.
2.5 Apply a small drop of Loctite 222MS thread locking compound to the threads of the Outlet Fitting Retaining Screw.
2.6 Install the Outlet Retaining Screw.
NOTE: DO NOT OVER TIGHTEN.

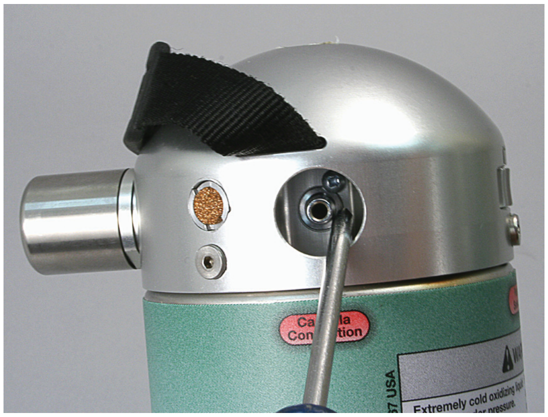


Figure 5

Section 3.0 Pressure Relief Valve removal/installation , refer to figure 6 - 8

Removal

3.1 Prop open the Vent Lever with a black O-ring tool. This will keep pressure from building while removing other components if there is any residual LOX in the container.

⚠CAUTION
When opening Vent Lever to release pressure from the EasyMate Portable always point the Vent Tube in a safe direction. DO NOT point discharging oxygen toward anyone or flammable material.

3.2 Using the Pressure Relief Valve Socket remove Pressure Relief Valve by unthreading it from Manifold.

NOTE: If the Pressure Relief Valve/O-ring stays in the manifold carefully remove to prevent it from being lost.

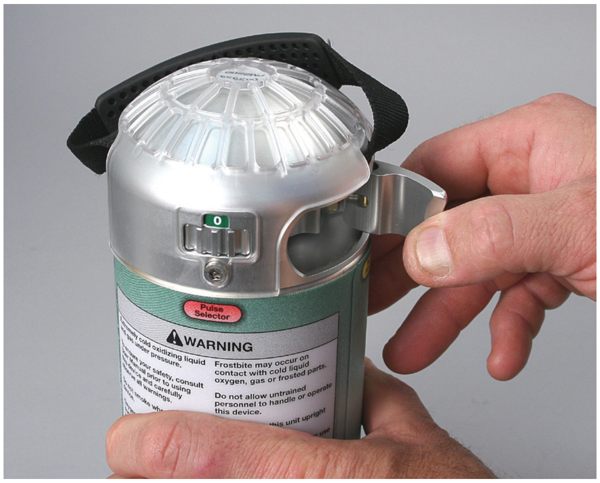

0
Pulse Selector
WARNING
Frostbite may occur on contact with cold liquid oxygen, gas or frosted parts.
Do not allow untrained personnel to handle or operate this device.

Figure 6

Installation

3.3. Install the Pressure Relief Valve/O-ring into position on the Pressure Relief Valve.

3.4 Install the Pressure Relief Valve/O-ring assembly into its port in the Manifold and tighten securely.

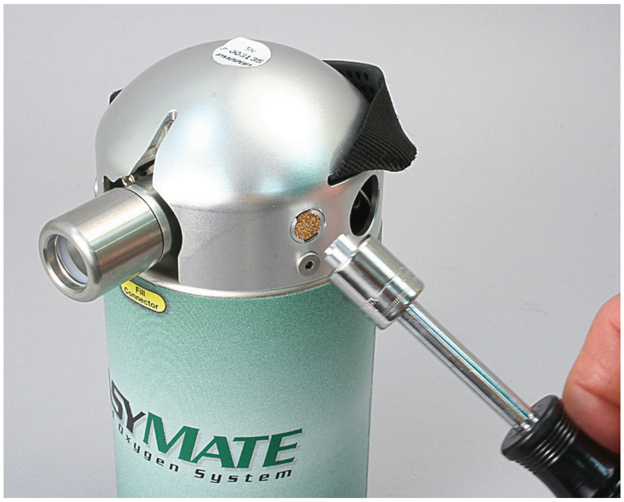

Fill Connector
SYMATE
Oxygen System

Figure 7

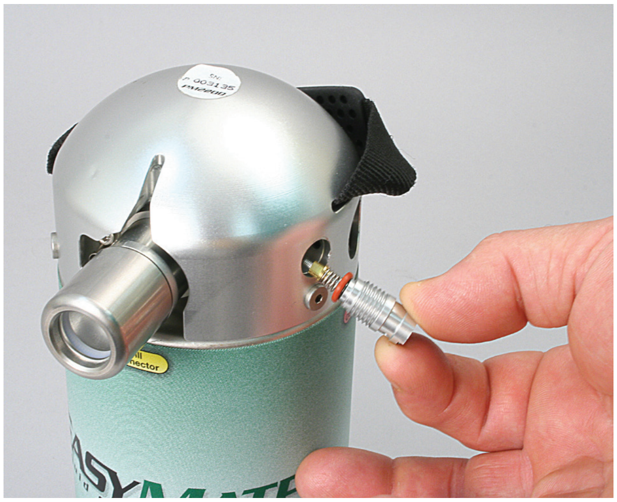


Figure 8

REMOVAL, INSTALLATION, REPAIR AND REPLACEMENT INSTRUCTIONS (continued)

Section 4.0 Vent to Fill Valve removal/installation, refer to figure 9 - 12

Removal

4.1 Remove the Pressure relief valve as per section 3.0.

4.2 Remove Vent Lever Screw, Vent Lever/Pivot Pin assembly, Wave Washer and Nylon Washer.
NOTE: The Vent Lever Screw was installed using thread locking compound.

4.3 Remove the Vent to Fill Valve by unthreading the Vent Valve Nut and remove it along with the Vent Valve Spring and Vent Valve Shaft/O-ring assembly.

Installation

4.4 Assemble the Vent to Fill Valve Sub-assembly by slipping the Vent to Fill Valve Spring and Nut on to the Vent to Fill Valve Shaft.

4.5 Install the Vent to Fill Valve Sub-assembly into its port in the Manifold and tighten securely.

4.6 Rotate the Vent to Fill Valve Shaft with pliers so the curved seat on its end will align with the Pivot Pin when installed in the vertical position.
NOTE: It is important to orient the seat on the end of the Shaft to the Pivot Pin. If the seat is not aligned properly the Vent to Fill Valve Pivot Lever will not lay flush with the Dome.

4.7 Slip the Pivot Pin into the Vent Lever so the countersink in the Pivot Pin is facing out.

4.8 Place a small drop of Loctite 222MS onto the threads of the Vent Lever Screw.

4.9 Install the Vent Lever Screw into the Vent Lever/Pivot Pin assembly and secure onto the Vent to Fill valve Shaft and tighten.

4.10 Install the Pressure Relief Valve as per section 3.0.

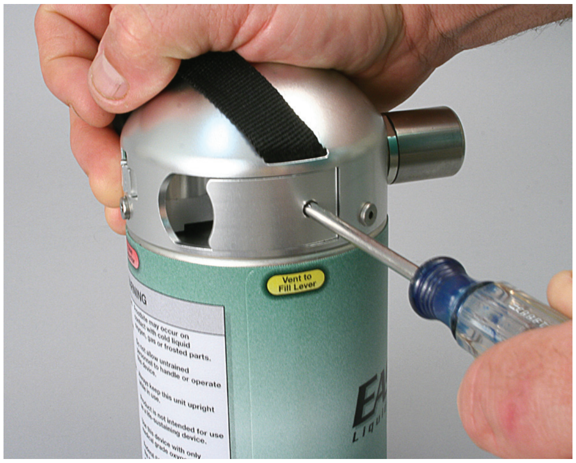


Figure 9

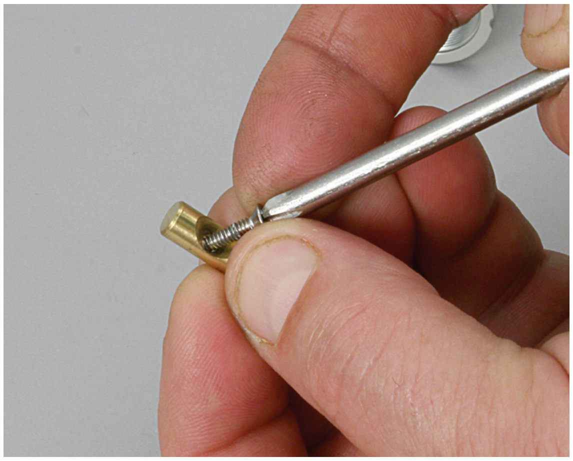


Figure 10

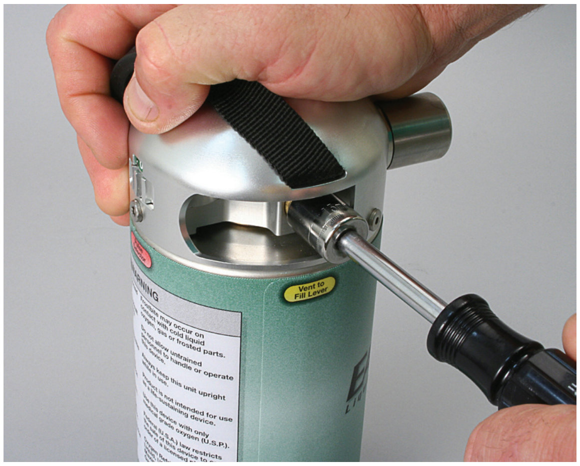


Figure 11

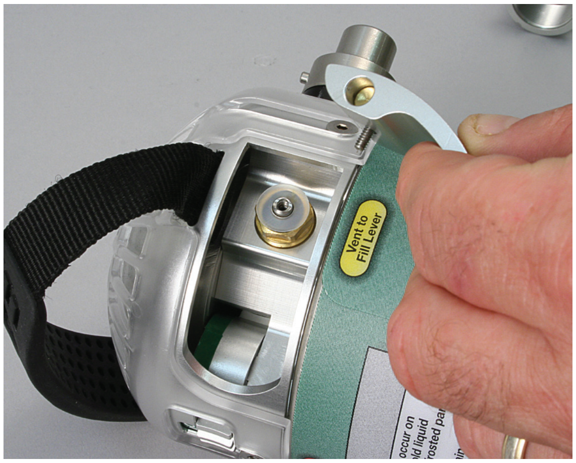


Figure 12

Section 5.0 Handle Replacement, refer to figure 13 & 14

Removal

5.1 Remove the Dome Cap as per section 1.0.

5.2 Using needle nose pliers or forceps reach in past the Outlet Fitting to grasp the end of the old Handle and pull out past the Outlet Fitting.

5.3 Reach in on the other side of the Dome, past the Vent Lever to grasp the other end of the old Handle and pull out.

5.4 Remove the old Handle by cutting the ends off the old Handle and pulling through their slots in the Dome.

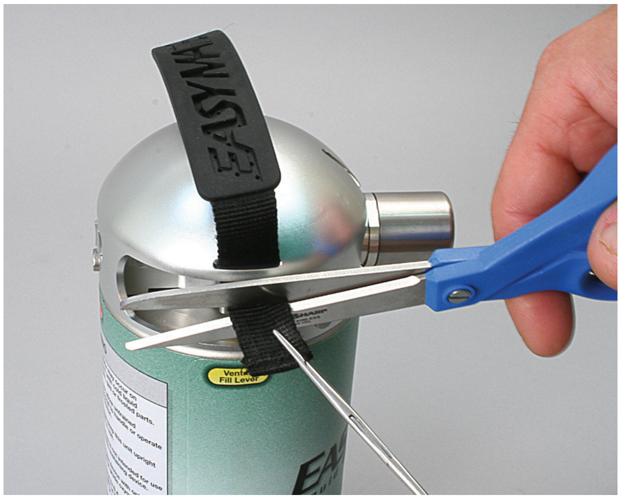


Figure 13

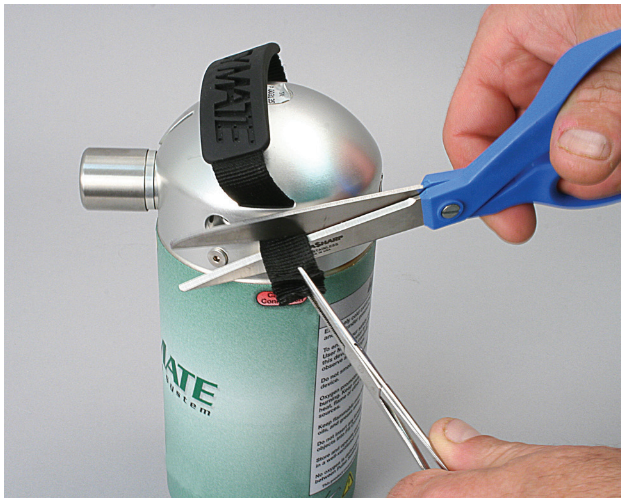


Figure 14

Installation

5.5 Position the EasyMate Portable with the Fill Connector facing you.

5.6 Align the new Handle so the “EasyMate Portable” logo on top is readable with the Fill connector facing you.

5.7 Slide the ends of the new Handle thru the slots in the Dome until the folded tab passes all the way to the inside of the Dome.

NOTE: If it is difficult to slide the ends into the Dome compress the ends of the new Handle in a vice prior to installation. You can also carefully use a flat bladed screw driver to help slide the Handle thru the slots.

5.8 Once installed tug on the handle to insure it has been properly installed.

Section 6.0 Container Label repair/replacement, refer to figure 15 & 16

NOTE: This procedure is intended to repair/replace a damaged Container Label by applying a new Container Label directly over the damaged original Container Label. Removal of the original Container Label is very difficult and unnecessary.

If the EasyMate Portable has already had a replacement Container Label applied it must be removed prior to applying another replacement Container Label. There should never be more theN two labels total on the Container.

It is easier to remove a replacement Container Label from the original Container Label then from the Container itself.

6.1 Remove the Dome Cap as per section 1.0.

6.2 Remove any of the old Container Label that is sticking up or is not adhered to the container.

6.3 Remove any dirt and contamination from the container label. Then, wipe with alcohol and allow to dry.

6.4 Position the EasyMate Portable on its side with the Fill Connector pointing to the left and the Outlet Fitting pointing up.

6.5 With the new Container Label's backing still in place, test fit the new Container Label. Check align by placing it over the old Container Label with the "Cannula Connection" graphics directly below the Outlet Fitting. Now wrap the new label around container.

NOTE: This will give you an idea of how the new label will fit. If the alignment is not square with the container the ends of the new label will not meet properly.

6.6 Peal the backing off the right side (behind the "Warning" graphic section) of the new Container Label.

6.7 Align the "Cannula Connection" graphics with the Outlet Fitting and with the top edge of the old label.

6.8 Carefully adhere the right side of the new Container Label to the old label making sure that the top edges are aligned.

6.9 Peel off the backing of the left side of the new Container Label and adhere to the old label making sure that the top edges are aligned.

6.10 Insure that the left end of the new label (rounded corners) overlaps the right end (square corners).

6.11 Confirm that the graphics align with their proper locations (i.e. Vent to Fill Lever, Fill Connector, Cannula Connection, Pulse Selector).

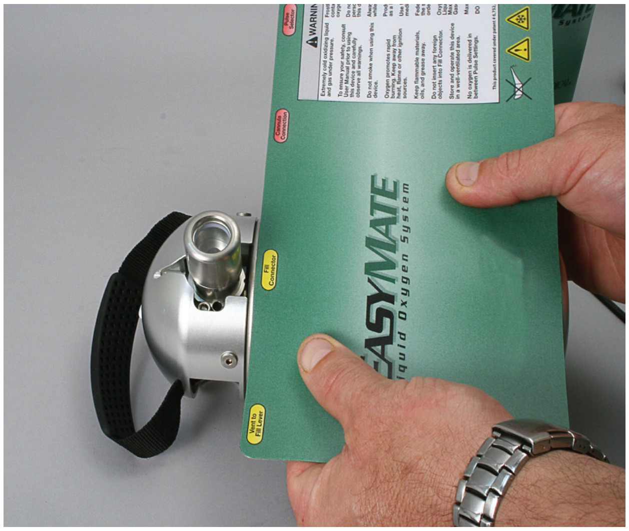


Figure 15

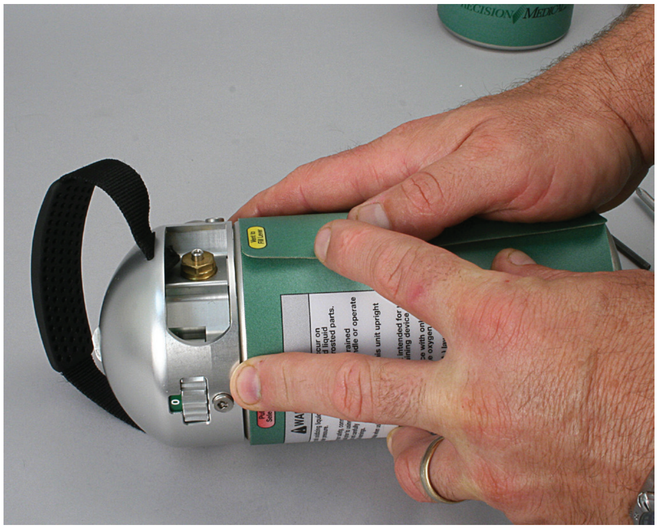


Figure 16

REMOVAL, INSTALLATION, REPAIR AND REPLACEMENT INSTRUCTIONS (continued)

Section 7.0 Dome removal, refer to figure 17 - 21

7.1 Remove Dome Cap as per Section 1.0

7.2 Prop open the Vent Lever with the black O-ring tool.
NOTE: This will keep pressure from building while removing other components if there is any residual LOX in the container.

⚠CAUTION

When opening Vent Lever to release pressure from the EasyMate Portable always point the Vent Tube in a safe direction. DO NOT point discharging oxygen toward anyone or flammable material.

7.3 Remove the Outlet Fitting as per section 2.0.

7.4 Remove the Pressure Relief as per section 3.0.

7.5 Remove the Vent to Fill Lever as per section 4.0.

7.6 Remove the three (3) Dome Retaining Screws.
NOTE: One of the dome screws may require the use of a special Tamper proof Screw Bit to remove. The Tamper proof Screw may be discarded and replaced with standard Dome Retaining screw (P/N 504128).

7.7 Using a dental pick or small awl pry out the three (3) Dome Retaining Screw Nylon Spacers.

7.8 Position the EasyMate Portable so the Pulse Selector is towards you.

7.9 Rotate the Pulse Selector past the setting ‘4’ position while pushing up slightly on the dome. This may take a little finesse. The objective is to rotate the Pulse Selector until its grooves have cleared the Dome.

7.10 Remove the Dome by pull up and twisting slightly back and forth.
NOTE: The Sense Diaphragm Spring is located just under the top of the Dome, make sure the spring stays in place.

7.11 Remove the Sense Diaphragm Spring from the Sense Diaphragm.

7.12 Remove the Sensitivity Adjustment Screw by turning it clockwise thru to the inside of the Dome.
NOTE: Units prior to S/N P011004 used a strong thread locking compound to secure the Sensitivity Adjustment Screw. If the hex socket becomes stripped while attempting to remove the Sensitivity Adjustment Screw it must be drilled out and removed with a broken screw extractor (Easy-out). Please follow the broken screw extractor manufacturers instructions to avoid damaging the Dome. Once the damaged Sensitivity Adjustment Screw has been removed and the Dome has not been damaged, chase (clean out) the threads in the dome with a 1/4 - 32 tap.

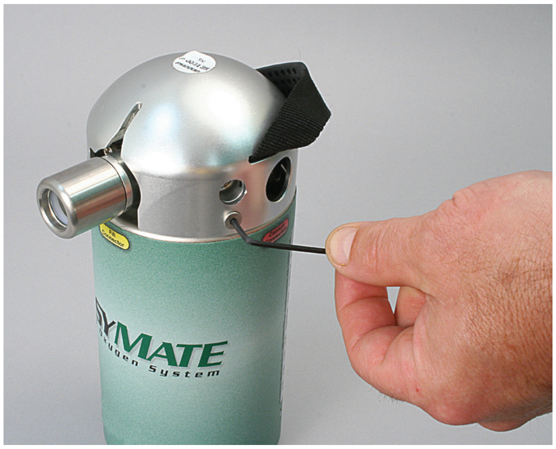


Figure 17

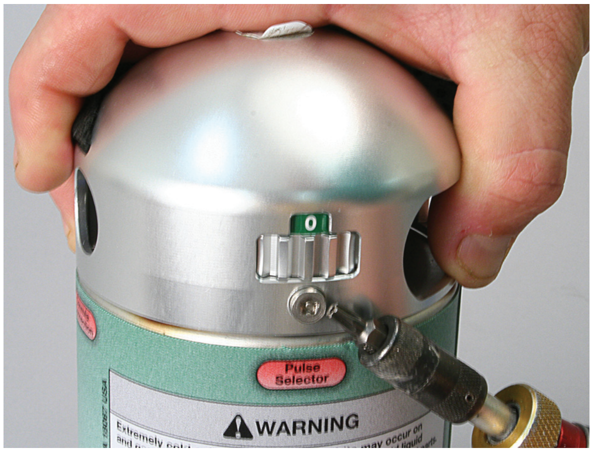


Figure 18

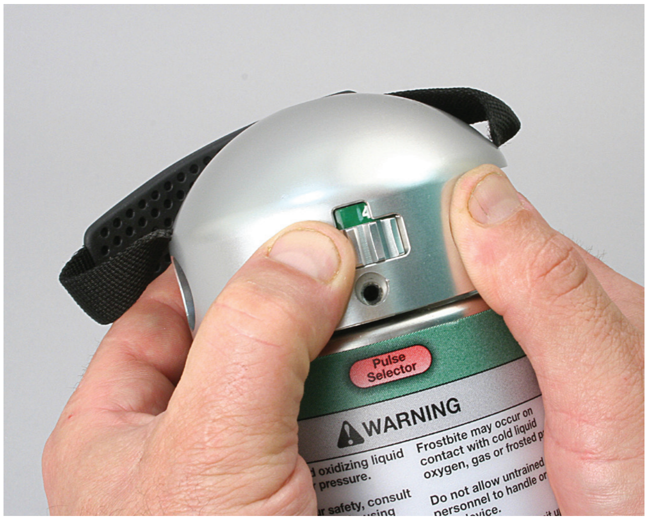


Figure 19

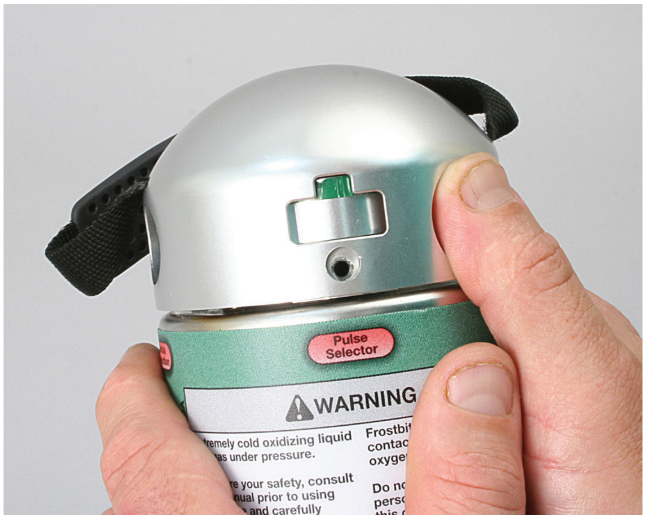


Figure 20

Section 8.0 Dome installation, refer to figure 17 - 21

8.1 Rotate the Pulse Selector so its grooves will clear the Dome during installation.

8.2 Align the Dome over the manifold so it will clear the Fill Connector.

8.3 Slowly slide the Dome onto the Manifold. When the Pulse Selector is aligned with its window in the Dome, rotate the Pulse Selector to the “0” position.

NOTE: Align the Dome and rotate the Pulse Selector into the “0” position. **Tip:** Try to keep the screw hole below the Pulse Selector in the Dome centered on its mating hole in the Manifold.

8.4 Insert the three (3) Dome Retaining Screw Nylon Spacers into position on the Dome.

8.5 Install the 3 Dome Retaining Screws using a 3/32 in. hex key.

NOTE:
- DO NOT OVER TIGHTEN.
- One of the dome screws may require the use of a special Tamper proof Screw Bit to remove. The Tamper proof Screw may be discarded and replaced with standard Dome Retaining screw (P/N 504128).

8.6 Install the Outlet Fitting as per section 2.0.

8.7 Install the Vent to Fill Valve assembly as per section 4.0.

8.8 Install the Pressure Relief Valve as per section 3.0.

8.9 Drop the Sense Diaphragm Spring into the top of the Dome.

8.10 Install the Sensitivity Adjustment Screw flush with the top of the Dome.

NOTE: DO NOT apply any thread locking compound prior to setting the trigger sensitivity as per section 27.0.

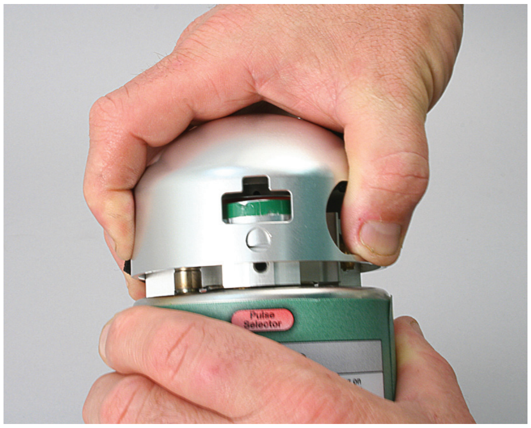


Figure 21

REMOVAL, INSTALLATION, REPAIR AND REPLACEMENT INSTRUCTIONS (continued)

Section 9.0 Conserver Sub-assembly removal, refer to figure 22 & 23

9.1 Remove the Dome as per section 7.0.

9.2 Remove the three (3) retaining screws from the Conserver Sub-assembly.
NOTE: These screws have been locked in place with thread locking compound.

9.3 Remove the Conserver Sub-assembly by lifting up.

NOTE: The bottom of the Conserver Sub-assembly seals to the Manifold with four (4) O-rings, make sure all O-rings stay in place.

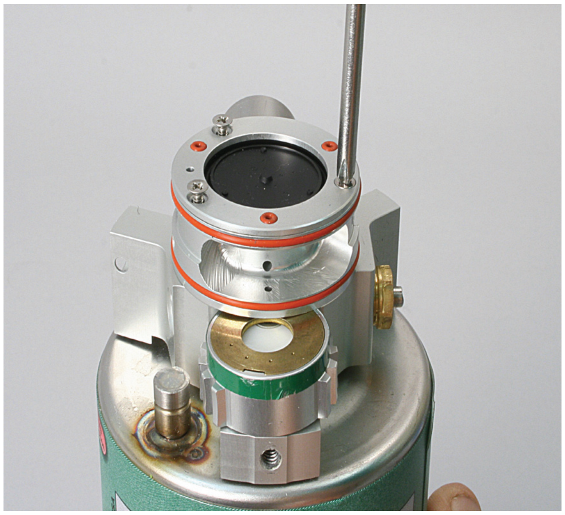


Figure 22

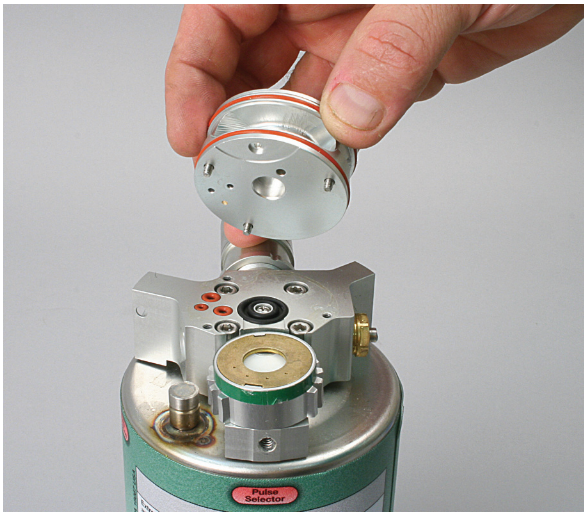


Figure 23

Section 10.0 Conserver sub-assembly installation, refer to figure 22 & 23

10.1 Place one (1) #005 (larger) O-ring and two (2) #003 (smaller) O-rings into their respective recesses on the manifold where the Conserver sub-assembly will seat.

10.2 If installing a new Conserver Sub-assembly remove the three (3) Conserver Retaining Screw Shipment Nuts and discard.

NOTE: DO NOT remove the three (3) Conserver Retaining Screws or Diaphragm Retainer Ring from the Conserver Sub-assembly.

10.3 Position the EasyMate Portable with the Fill Connector pointing away from you and the Pulse Selector is pointing towards you.

10.4 Place a small drop of Loctite 222MS on the end of each of the three (3) Conserver Retaining Screws.

10.5 Place the #004 (medium) O-ring into its recess on the bottom of the Conserver Sub-assembly.

10.6 Place the Conserver Sub-assembly onto the manifold so that the #004 O-ring seats onto the Pulse Selector Orifice Plate and the three (3) Conserver Sub-assembly Screws align with their corresponding holes in the Manifold.

10.7 Tighten the Conserver Retaining Screws in an alternating pattern.
NOTE: DO NOT OVER TIGHTEN!.

10.8 Place three (3) #003 (smaller) O-rings onto their recess on the Diaphragm Retaining Ring.

10.9 Install the Dome as per section 8.0.

Section 11.0 Orifice Plate replacement, refer to figure 24

Removal

11.1 Remove the Dome as per section 7.0.
11.2 Remove the Conserver Sub-assembly as per section 9.0.
11.3 Carefully lift the Orifice Plate out of the Pulse Selector Knob.
NOTE: Be careful not to lift the Pulse Selector Knob and make sure the Detent Balls and spring stay in place.

Installation

11.4 Position the Orifice Plate by aligning its slots with the taps in the Pulse Selector Knob and dropping into place.
NOTE: The slots and taps are designed so the Orifice Plate can not be installed incorrectly.
11.5 Install the Conserver Sub-assembly as per section 10.0.
11.6 Install the Dome as per section 8.0.

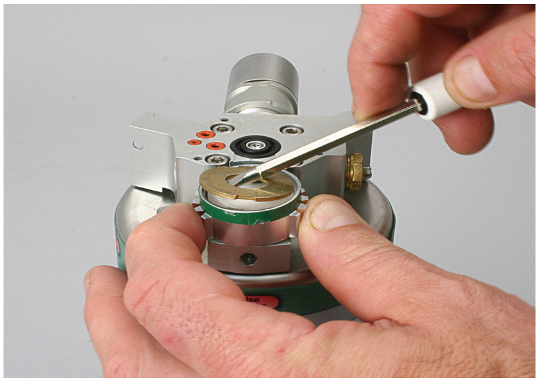


Figure 24

Section 12.0 Pulse selector Knob replacement, refer to figure 25 & 26

Removal

12.1 Remove the Dome as per section 7.0.
12.2 Remove the Conserver Sub-assembly as per section 9.0.
12.3 Remove the Orifice Plate as per Section 11.0.
12.4 Hold two (2) fingers around the sides of the Pulse Selector Knob to keep the Detent Balls and Spring from popping out of the manifold, lift up the Pulse Selector Knob and discard.

Installation

12.5 Hold the Detent Balls and Spring in position with two fingers.
12.6 Slip the Pulse Selector Knob into position over the Detent Balls.
12.7 Install the Orifice Plate as per section 11.0.
12.8 Install the Conserver Sub-assembly as per section 10.0.
12.9 Install the Dome as per section 8.0.

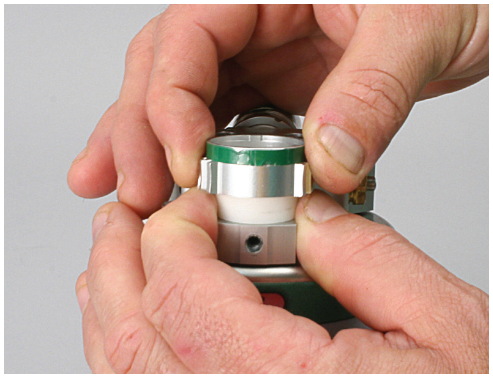


Figure 25

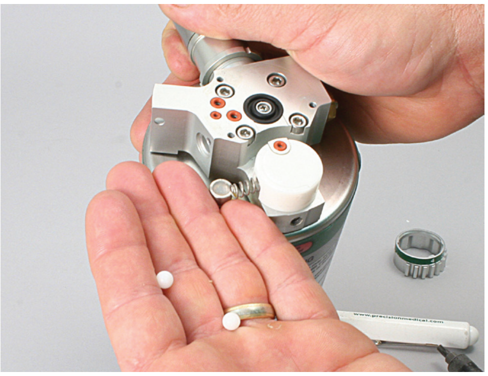


Figure 26

REMOVAL, INSTALLATION, REPAIR AND REPLACEMENT INSTRUCTIONS (continued)

Section 13.0 Probe Diaphragm replacement, refer to figure 27 – 36

Removal

13.1 Remove the Dome as per Section 7.0.

13.2 Remove the Conserver Sub-assembly as per section 9.0.

13.3 Remove the four (4) Manifold Retaining Screws and set aside.
NOTE: These screws have been locked in place with thread locking compound.

13.4 Carefully lift the Manifold/Probe assembly up and out of the Container.

⚠CAUTION
Caution must be exercised when handling the Probes. Any damage to the probes mating surfaces may cause the Probe assembly to malfunction. NEVER rotate the probes mating surfaces against one another when engaged.

13.5 Grasp the Manifold in one hand and the Probe Support assembly with the other and carefully separate the Probe Support assembly from the Manifold by wiggling it slightly back and forth, set the Probe Support/Upper Probe assembly aside.
NOTE: The Probe Support assembly will slide off the Upper Probe/Spring assembly and Fill Tube.

13.6 Carefully place the Manifold/Upper Probe assembly into the Probe Holding Fixture, secure with a holding screw and clamp the Upper Probe.
NOTE: Great care must be exercised when handling the probes. Any damage to the Probes mating surfaces will cause the Probe assembly to malfunction.

13.7 Remove the Probe Diaphragm Retaining Screw and Cap, set aside.
NOTE: The Probe Retaining Screw has been locked in place with thread locking compound.

13.8 Remove old Probe Diaphragm and discard.

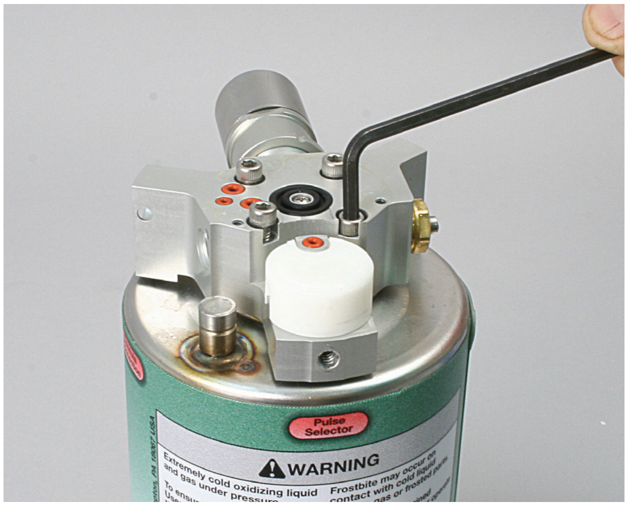


Figure 27

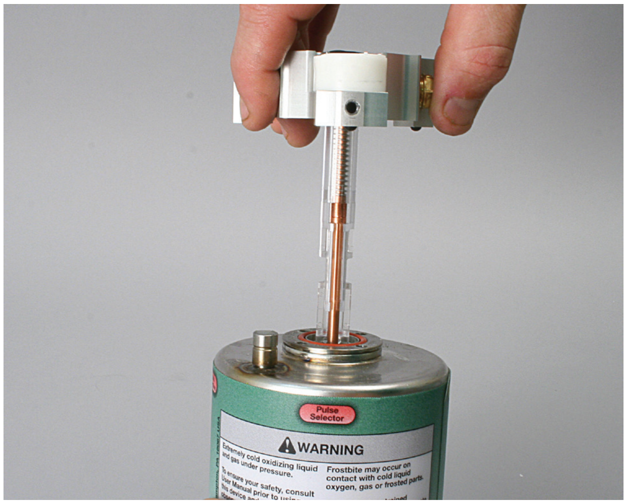


Figure 28

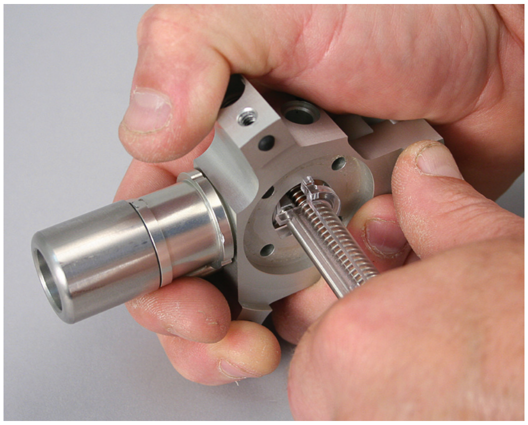


Figure 29

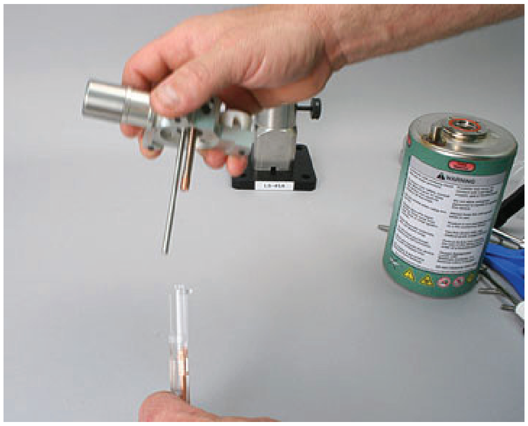


Figure 30

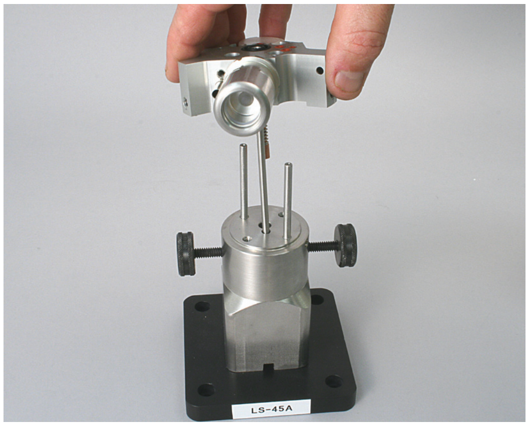


Figure 31

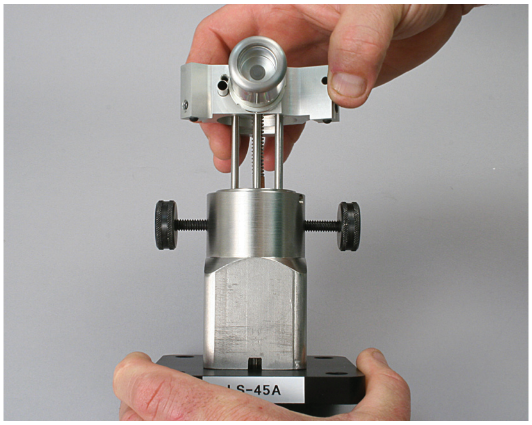


Figure 32

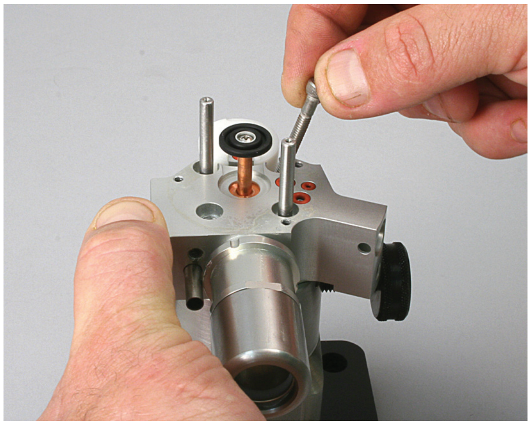


Figure 33

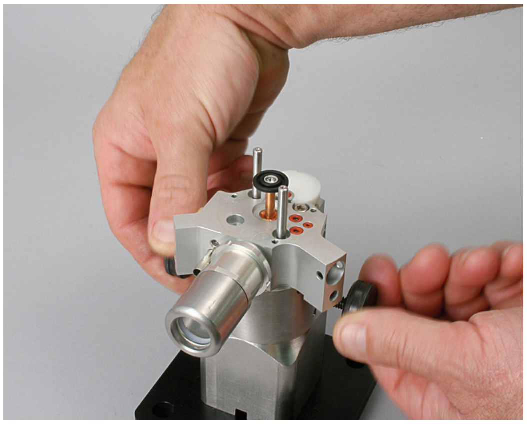


Figure 34

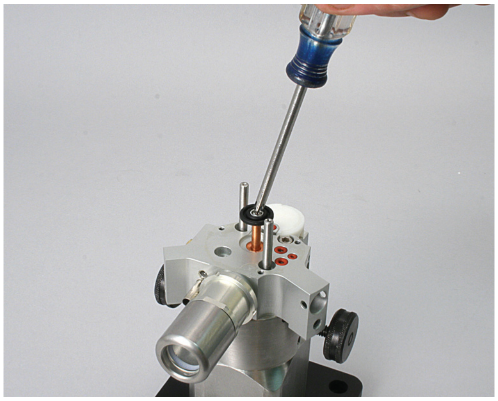


Figure 35

Installation

13.9 With the Manifold/Upper Probe assembly in the Probe Holding Fixture, place the new Probe Diaphragm into position, confirm proper orientation.

13.10 Place a small drop of Loctite 222MS thread locking compound into the threads of the Upper Probe.

13.11 Install Probe Diaphragm Retaining Screw and Cap.
NOTE: DO NOT OVER TIGHTEN!.

13.12 Remove Manifold/Upper Probe assembly from the Probe Holding Fixture.

13.13 Carefully Align the Probe Support assembly with the Fill tube and Upper Probe/Spring assembly.
NOTE: Great care must be exercised when handling the Upper Probe. Any damage to its mating surface may cause the Probe assembly to malfunction.

13.14 Slide the Probe Support assembly into position and engage the two tabs on the top of the Probe Support with their corresponding slots in the Manifold.
NOTE: Make sure the tabs have engaged the slots.

13.15 Carefully align the Manifold/Probe assembly into its proper position on the Container (i.e. Fill Connector with "Fill Connector" graphics on the Container Label) and slide down into position.

13.16 Align the screw holes in the Manifold with their corresponding holes in the Container.
NOTE: The Containers Pump Out Port should be to the right of the Pulse Selector.

13.17 Place a small drop of Loctite 222MS thread locking compound on the threads of the Manifold Retaining Screws holes in the Container.

13.18 Drop the Manifold Retaining Screw into position in the Manifold and tighten securely.

13.19 Install the Conserver Sub-assembly as per section 10.0.

13.20 Install the Dome as per section 8.0.

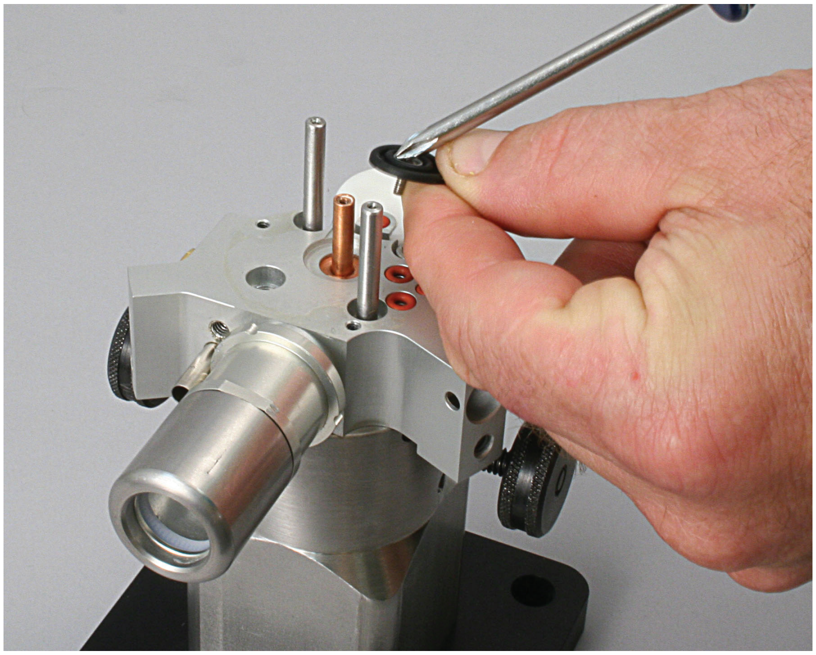


Figure 36

REMOVAL, INSTALLATION, REPAIR AND REPLACEMENT INSTRUCTIONS (continued)

Section 14.0 Probe Sub-assembly removal, refer to figure 27 – 36

14.1 Remove the Dome as per Section 7.0.
14.2 Remove the Conserver Sub-assembly as per section 9.0.
14.3 Remove the four (4) Manifold Retaining Screws and set aside.
NOTE: These screws have been locked in place with thread locking compound.
14.4 Carefully lift the Manifold/Probe assembly up and out of the Container.

⚠CAUTION

Caution must be exercised when handling the Probes. Any damage to the probes mating surfaces may cause the Probe assembly to malfunction. NEVER rotate the probes mating surfaces against one another when engaged.

14.5 Grasp the Manifold in one hand and the Probe Support assembly with the other and carefully separate the Probe Support/Upper Probe assembly from the Manifold by wiggling it slightly back and forth, set the Probe Support aside.
NOTE: The Probe Support assembly will slide off the Upper Probe/Spring assembly and the Fill Tube.
14.6 Carefully place the Manifold/Upper Probe assembly into the Probe Holding Fixture, secure with a holding screw and clamp the Probe.
NOTE: Great care must be exercised when handling the Upper Probe. Any damage to its mating surface may cause the Probe assembly to malfunction.
14.7 Remove the Probe Diaphragm Retaining Screw and Cap.
NOTE: The Probe Retaining Screw has been locked in place with thread locking compound.
14.8 Remove the Probe Diaphragm.
14.9 Remove Manifold assembly from the Probe Holding Fixture.
NOTE: Be careful that the Thermal Transfer Ring does not fall out of the Manifold.
14.10 Remove the Upper Probe and Probe Spring from the Probe Holding Fixture.
NOTE: If the Upper Probe will be re-installed it is very important to protect the mating surface from being damaged in any way. The Upper Probe and its corresponding Lower Probe are matched sets and should always be replaced as a set.

Section 15.0 Probe Sub-assembly installation, refer to figure 37-45

15.1 Position the Probe Holding Fixture with its front facing you.
15.2 Place the Upper Probe into the Probe Holding Fixture and secure.
NOTE: Great care must be exercised when handling the Upper Probe. Any damage to its mating surface may cause the Probe assembly to malfunction.
15.3 Place the Probe Spring on to the shaft of the Upper Probe.
15.4 Insure that the Thermal Transfer Rings in its position in the Manifold assembly.
15.5 Carefully align the Manifold assembly with the Fill Connector towards you onto the Probe Holding Fixture.
15.6 Slide the Manifold into position on the Probe Holding Fixture with the Upper Probe passing thru the Thermal Transfer Ring and secure into place.
15.7 With the Manifold/Upper Probe assembly in the Probe Holding Fixture place the new Probe Diaphragm into position, confirm proper orientation.
15.8 Place a small drop of Loctite 222MS into the threads of the Upper Probe.
15.9 Install Probe Diaphragm Retaining Screw and Cap.
NOTE: DO NOT OVER TIGHTEN!.
15.10 Remove Manifold/Upper Probe assembly from the Probe Holding Fixture.

15.11 Carefully Align the Probe Support assembly with the Fill tube and Upper Probe/Spring assembly.
NOTE: Great care must be exercised when handling the Upper Probe. Any damage to its mating surface may cause the Probe assembly to malfunction.

15.12 Slide the Probe Support assembly into position and engage the two tabs on the top of the Probe Support with their corresponding slots in the Manifold.
NOTE: Make sure the tabs have engaged the slots.

15.13 Carefully align the Manifold/Probe assembly into its proper position on the Container (i.e. Fill Connector with “Fill Connector” graphics on the Container Label) and slide down into position.

15.14 Align the screw holes in the Manifold with their corresponding holes in the Container.
NOTE: The Containers Pump Out Port should be to the right of the Pulse Selector Knob.

15.15 Place a small drop of Loctite 222MS thread locking compound on the threads of the Manifold Retaining Screws holes in the Container.

15.16 Drop the Manifold Retaining Screw into position in the Manifold and tighten securely.

15.17 Install the Conserver Sub-assembly as per section 10.0.

15.18 Install the Dome as per section 8.0.

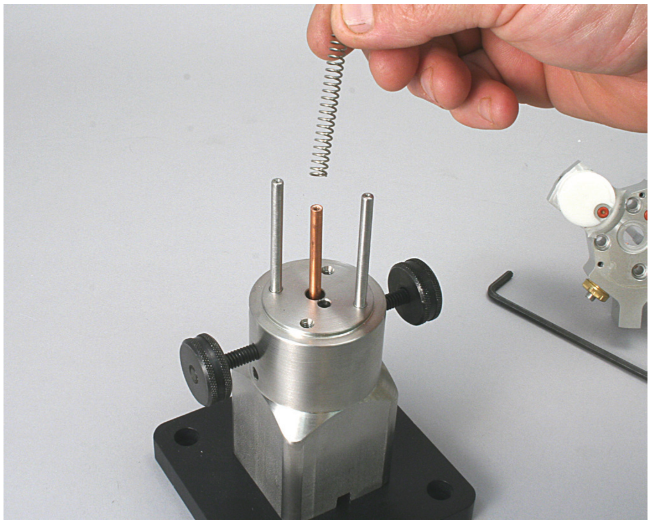


Figure 37

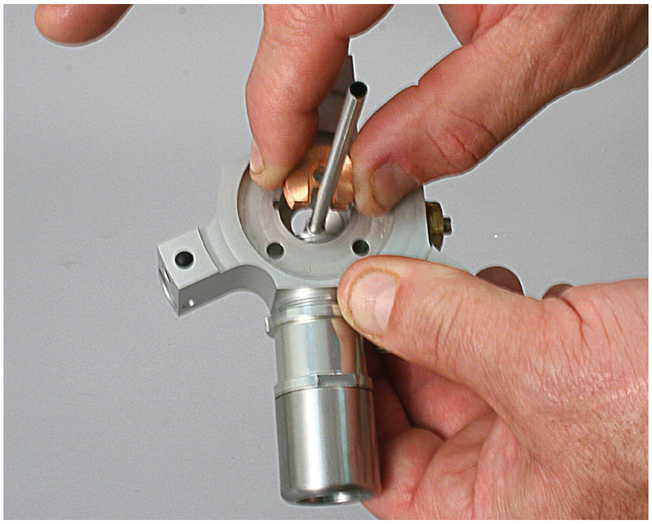


Figure 38

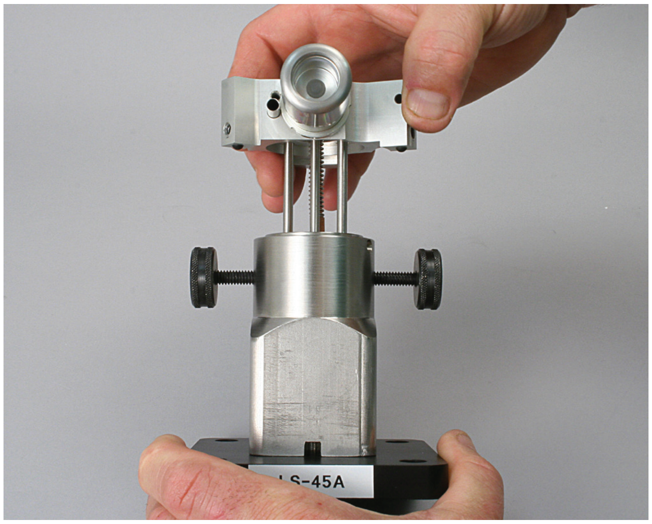


Figure 39

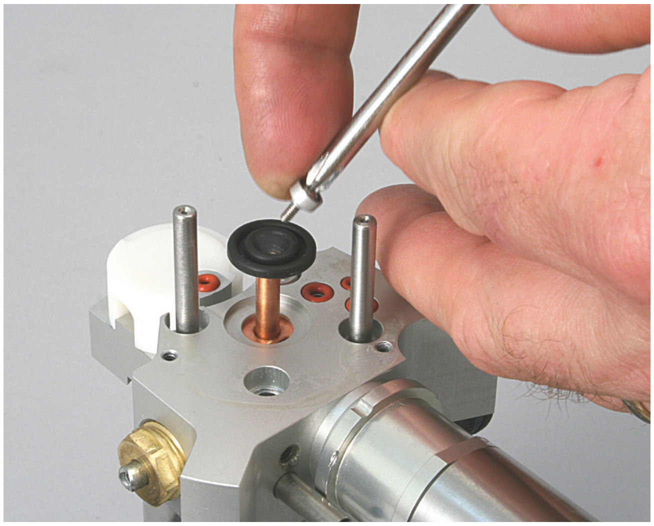


Figure 40

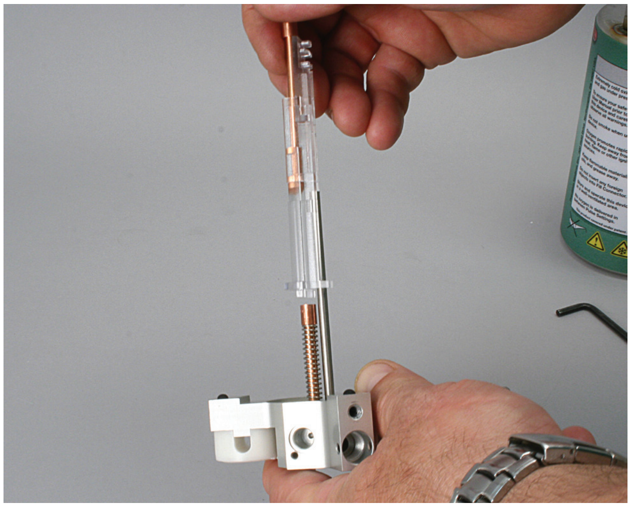


Figure 41

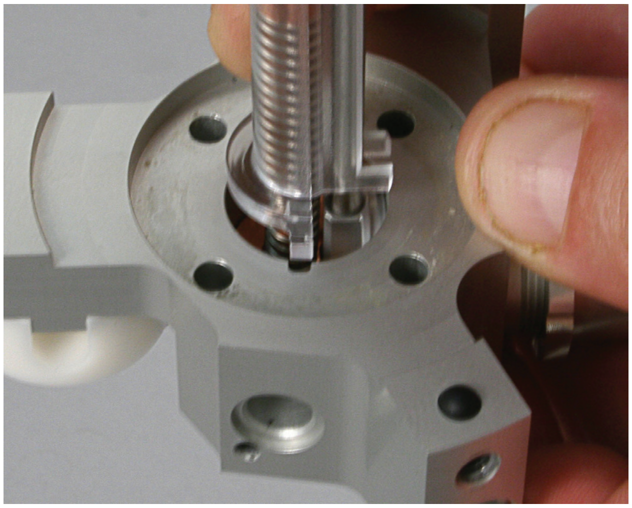


Figure 42

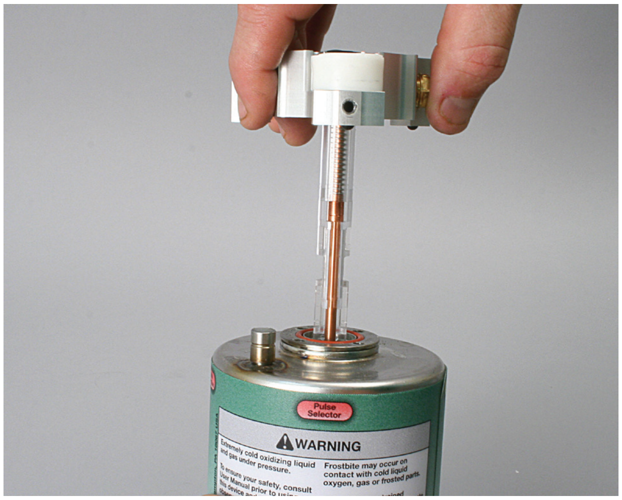

Pulse Selector
WARNING

Figure 43

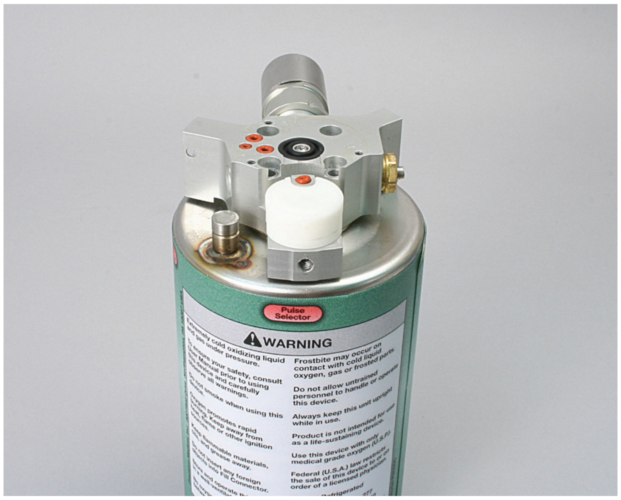

Pulse Selector
WARNING

Figure 44

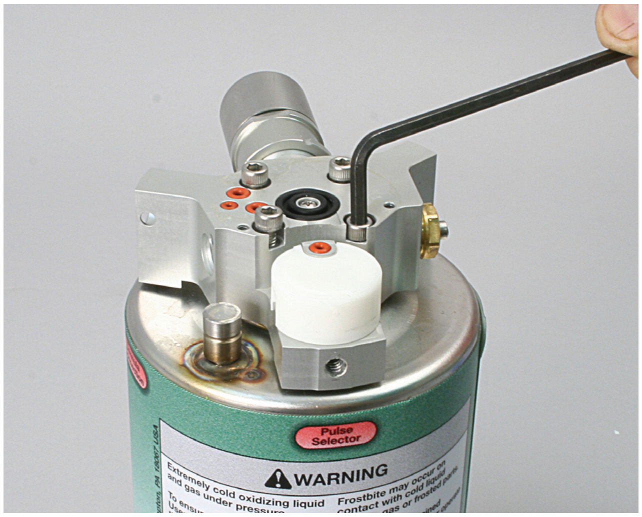

Pulse Selector
WARNING

Figure 45

Section 16.0 Cryogenic Container removal, refer to figure 46

16.1 Remove the Dome as per Section 7.0.
16.2 Remove the Conserver Sub-assembly as per section 9.0.
16.3 Remove the four (4) Manifold Retaining Screws and set aside.
NOTE: These screws have been locked in place with thread locking compound.
16.4 Carefully lift the Manifold/Probe assembly up and out of the Container and set aside.

⚠CAUTION
Caution must be exercised when handling the Probes. Any damage to the probes mating surfaces may cause the Probe assembly to malfunction. NEVER rotate the probes mating surfaces against one another when engaged.

Section 17.0 Cryogenic Container installation, refer to figure 46

17.1 Place the Container Flange O-ring into its position on the Container.
17.2 Carefully align the Manifold/Probe assembly into its proper position on the Container with the Pump Out Port just to the right of the Pulse Selector Knob and slide down into position.
17.3 Align the screw holes in the Manifold with their corresponding holes in the Container.
NOTE: The Containers Pump Out Port should be to the right of the Pulse Selector Knob.
17.4 Place a small drop of Loctite 222MS thread locking compound on the threads of the Manifold Retaining Screws holes in the Container.
17.5 Drop the Manifold Retaining Screw into position in the Manifold and tighten securely.
17.6 Install the Conserver Sub-assembly as per section 10.0.
17.7 Install the Dome as per section 8.0.
17.8 Install the container label as per section 6.0.

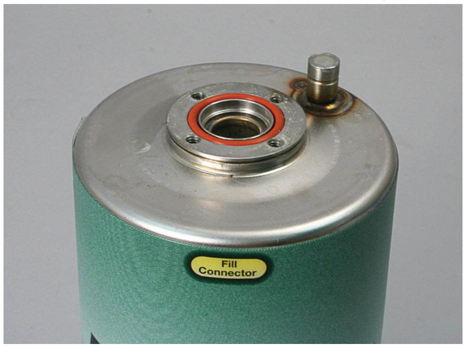


Figure 46

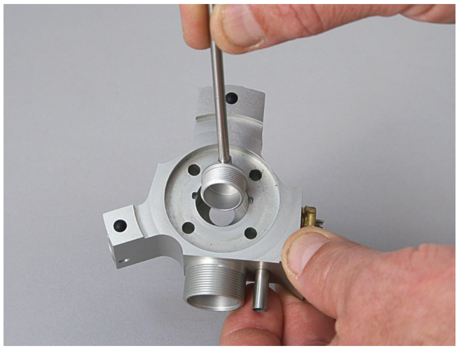


Figure 47

Section 18.0 Manifold removal, refer to figure 47

18.1 Remove the Fill connector as per section 20.0.
18.2 Remove the Dome as per Section 7.0.
18.3 Remove the Conserver Sub-assembly as per section 9.0.
18.4 Remove the Pulse Selector/Orifice Plate assembly as per section 11.0 & 12.0.
18.5 Remove the Probe Sub-assembly as per section 14.0.
18.6 Remove Manifold assembly from the Probe Holding Fixture.
18.7 Remove the Thermal Transfer Ring.
18.8 Remove the Fill Tube assembly.

Section 19.0 Manifold Installation, refer to figure 47

19.1 Install the Fill Tube assembly into position.
19.2 Install the Thermal Transfer Ring into position.
19.3 Install the Probe assembly as per section 15.0.
19.4 Remove the Pulse Selector/Orifice Plate assembly as per section 11.0 & 12.0.
19.5 Install the Conserver Sub-assembly as per section 10.0.
19.6 Install the Dome as per section 8.0.

Section 20.0 Fill Connector Removal and disassembly instructions (all models)

P-B Fill Connector, refer to figure 48 – 50 & 54

20.1 Prop open the Vent Lever with a black O-ring tool. This will keep pressure from building while removing other components if there is any residual LOX in the container.

⚠CAUTION
When opening Vent Lever to release pressure from the EasyMate Portable always point the Vent Tube in a safe direction. DO NOT point discharging oxygen toward anyone or flammable material.

20.2 Remove the Socket Head Retaining Cap Screw.
20.3 Remove the Fill Connector Collar using the special 15/16 in. flat wrench.
20.4 Using a dental pick or small awl remove the Lip Seal from the Fill Connector Collar Assembly and discard.
20.5 Remove the Fill Connector Body using the special 3/4 in. flat wrench.
20.6 Remove the Poppet Assembly and discard.
20.7 Remove the O-ring from the Fill Connector Body and discard.

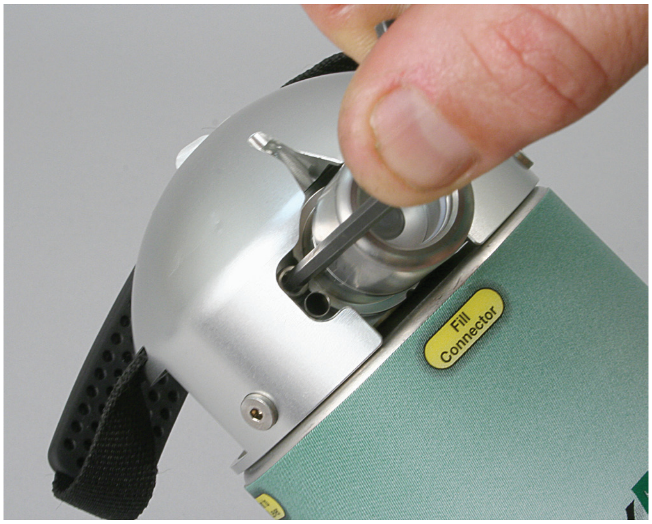


Figure 48

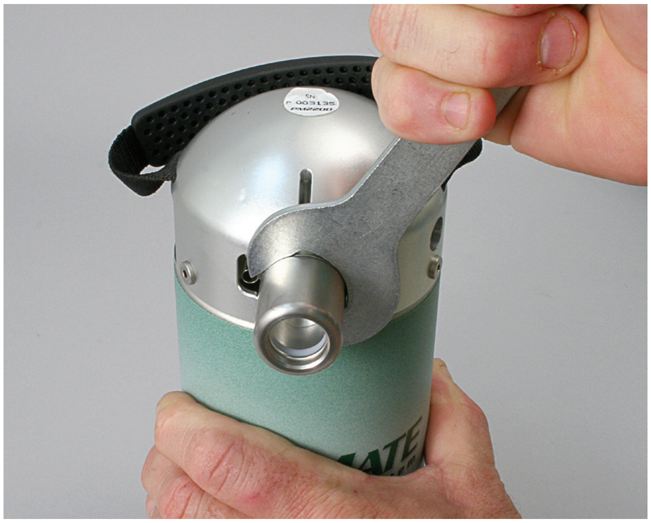


Figure 49

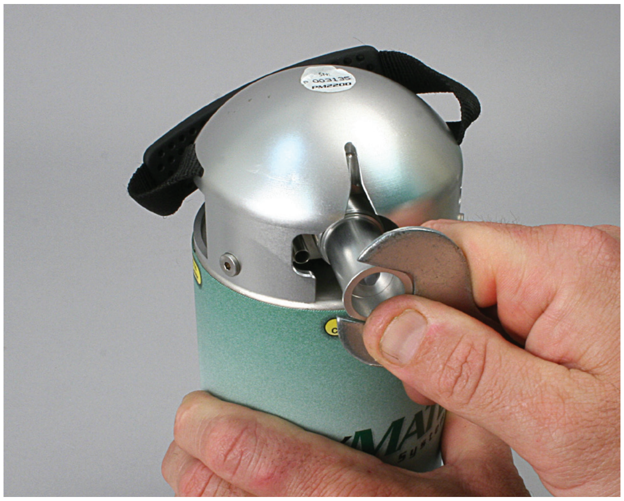


Figure 50

Mark Series Fill Connector, refer to figure 48, 52, 53, 55 & 56

20.8 Prop open the Vent Lever with a black O-ring tool. This will keep pressure from building while removing other components if there is any residual LOX in the container.

⚠CAUTION
When opening Vent Lever to release pressure from the EasyMate Portable always point the Vent Tube in a safe direction. DO NOT point discharging oxygen toward anyone or flammable material.

20.9 Remove the Socket Head Retaining Cap Screw.
20.10 Remove the Fill Connector Body Assembly using the special 7/8 in. flat wrench.
20.11 Remove the Fill Connector Insert Assembly.
20.12 Remove the O-ring from the Fill Connector Insert and discard.
20.13 Using internal retaining ring pliers remove the Retaining Ring from the Fill Connector Body.
20.14 Remove the Flat Washer, Conical Spring, Poppet Guide, Seal and O-ring from inside the Fill Connector Body and discard.

Caire Fill Connector, refer to figure 48, 51, 53, 55 & 56

20.15 Prop open the Vent Lever with a black O-ring tool. This will keep pressure from building while removing other components if there is any residual LOX in the container.

⚠CAUTION
When opening Vent Lever to release pressure from the EasyMate Portable always point the Vent Tube in a safe direction. DO NOT point discharging oxygen toward anyone or flammable material.

20.16 Remove the Socket Head Retaining Cap Screw.
20.17 Remove the Fill Connector Body Assembly using the special 7/8 in. flat wrench.
20.18 Remove the Fill Connector Insert Assembly.
20.19 Remove the O-ring from the Fill Connector Insert and discard.
20.20 Using internal retaining ring pliers remove the Retaining Ring from the Fill Connector Body.
20.21 Remove the Flat Washer, Spring, Seal and O-ring from inside the Fill Connector Body and discard.

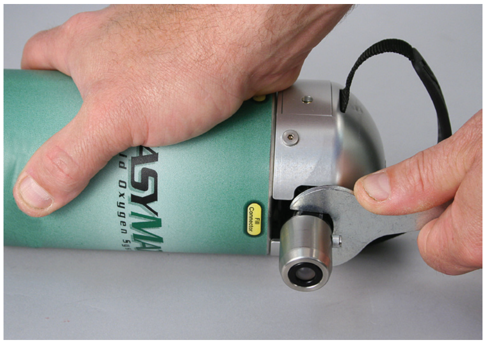


Figure 51

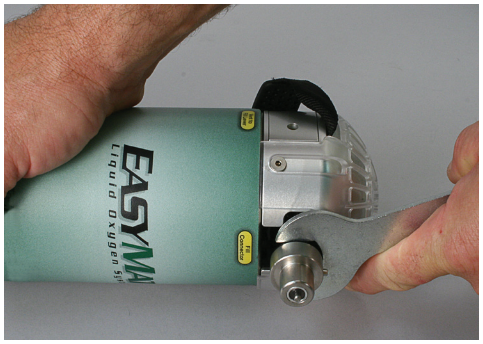


Figure 52

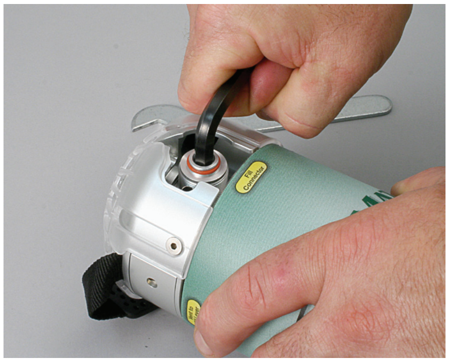


Figure 53

REMOVAL, INSTALLATION, REPAIR AND REPLACEMENT INSTRUCTIONS (continued)

Section 21.0 Fill Connector assembly and installation instructions (all models)

P-B Fill Connector, refer to figure 54

21.1 Place O-ring on Full Connector Body.

21.2 Insert Poppet Assembly into Fill Connector Body, and then insert Poppet Spacer into Fill Connector Body.

21.3 Thread the Fill Connector Body Assembly into the Manifold

21.4 Tighten the Fill Connector Body Assembly using the special 15/16 in. flat wrench to 75-85 in-lbs (8.47-9.60 N-m) torque (approximately a 60° turn on wrench after metal to metal contact).
NOTE: DO NOT OVER TIGHTEN! Damage to the Fill Tube Assembly in the manifold may occur.

21.5 Place Lip Seal onto lip seal insertion toll open end first. Slide the Fill Connector Collar over lip seal insertion tool until in 'snaps' into position. Remove insertion tool.
NOTE: Ensure correct orientation of Lip Seal.

21.6 Thread the Fill Connector Collar Assembly into the Manifold over the Fill Connector Body Assembly by hand until snug.

21.7 Tighten the Fill Connector Collar to 85-95 in-lbs (9.60-10.73 N-m) of torque using the special 15/16 in. flat wrench (approximately 45° turn of wrench after hand snug).

21.8 Apply a few drops of Loctite 222MS thread locking compound to the threads of the Socket Head Retaining Cap Screw and install into manifold.

21.9 Using long side of hex key hand tighten the Socket head Retaining Cap Screw.
NOTE: DO NOT OVER TIGHTEN!

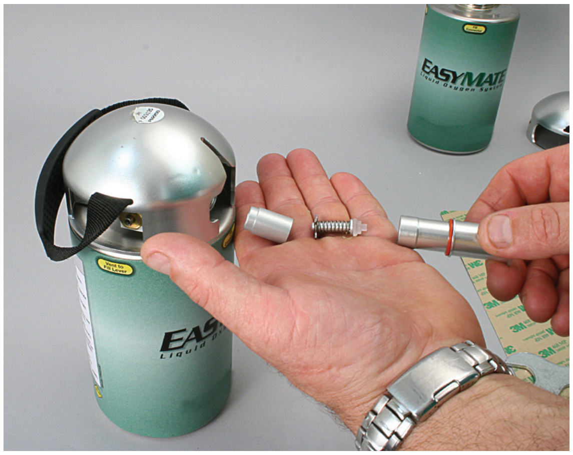


Figure 54

Mark Series Fill Connector, refer to figure 51, 53 & 55

21.10 Place O-ring onto Fill Connector Insert.

21.11 Thread Fill Connector Insert Assembly into Manifold using hex wrench, tighten to 75-85 in-lbs (8.47-9.60 N-m) torque (approximately a 60° turn of wrench after metal to metal contact).
NOTE: DO NOT OVER TIGHTEN! Damage to the Fill Tube Assembly in the manifold may occur.

21.12 Place O-ring into groove of Fill Connector insert.

21.13 Insert small end of Conical Spring into open end of Poppet Guide.

21.14 Insert Poppet Seal into Poppet Guide.

21.15 Slide Popper Assembly seal end first into the Fill Connector Body.

21.16 Place the Flat Washer over the end of the Conical Spring in Fill Connector Body.

21.17 Using internal retaining ring pliers insert the Retaining Ring into the groove at the end of the Fill Connector Body.

21.18 Thread the Fill Connector Assembly into the Manifold by hand until snug.

REMOVAL, INSTALLATION, REPAIR AND REPLACEMENT INSTRUCTIONS (continued)

21.19 Tighten the Fill Connector Assembly to 85-95 in-lbs (9.60-10.73 N-m) of torque using the special 7/8 in. flat wrench (approximately 45° turn of wrench after hand snug).

21.20 Apply a few drops of Loctite 222MS thread locking compound to the threads of the Socket Head Retaining Cap Screw and install into manifold.

21.21 Using long side of hex key hand tighten the Socket head Retaining Cap Screw.
NOTE: DO NOT OVER TIGHTEN!

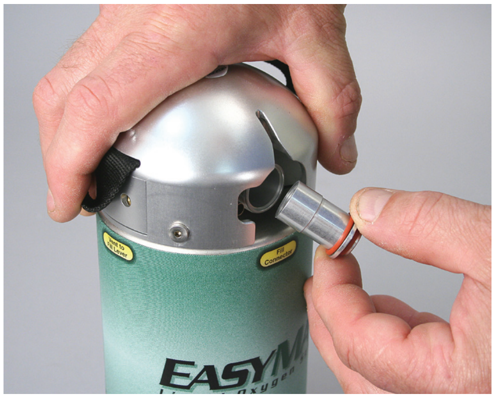


Figure 55

Caire Fill Connector, refer to figure 52, 53, 55 & 56

21.22 Place O-ring onto Fill Connector Insert.

21.23 Thread Fill Connector Insert Assembly into Manifold using hex wrench, tighten to 75-85 in-lbs (8.47-9.60 N-m) torque (approximately a 60° turn of wrench after metal to metal contact).
NOTE: DO NOT OVER TIGHTEN! Damage to the Fill Tube Assembly in the manifold may occur.

21.24 Place O-ring into groove of Fill Connector Seal.

21.25 Place Poppet Spring onto Fill Connector Seal Assembly.

21.26 Slide Poppet Assembly seal end first into the Fill Connector Body.

21.27 Place the Flat Washer onto Poppet Spring in Fill Connector Body.

21.28 Using internal retaining ring pliers insert the Retaining Ring into the groove at the end of the Fill Connector Body.

21.29 Thread the Fill Connector Assembly into the Manifold by hand until snug.

21.30 Tighten the Fill Connector Assembly to 85-95 in-lbs (9.60-10.73 N-m) of torque using the special 7/8 in. flat wrench (approximately 45° turn of wrench after had snug).

21.31 Apply a few drops of Loctite 222MS thread locking compound to the threads of the Socket Head Retaining Cap Screw and install into manifold.

21.32 Using long side of hex key hand tighten the Socket head Retaining Cap Screw.
NOTE: DO NOT OVER TIGHTEN!

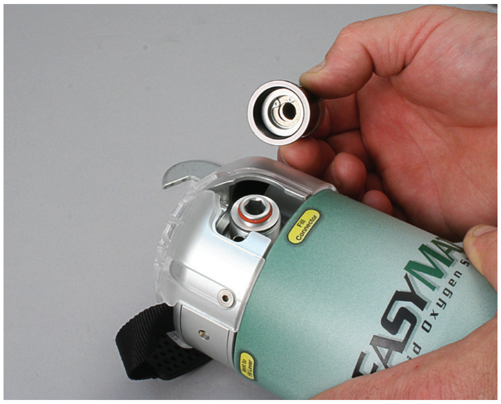


Figure 56

TEST INSTRUCTIONS / AOVP (Advanced Operation Verification Procedure)

Section 22.0 Pressure Relief Valve/leak-down, refer figure 57 - 59

Relief Valve Test

22.1 Connect Probe/Pressure Test Fixture to a compressed oxygen source of 70 to 100 psi (4.82 - 6.89 bar) via its inlet fitting.

22.2 Attach the appropriate fill connector adaptor to Probe/Pressure Test Fixture and engage into Fill Connector.

22.3 Place the EasyMate Portable into the Probe/Pressure Test Fixture and secure.

22.4 Ensure that the EasyMate Portable is set to setting “0”.

22.5 Set and observe the controls on the Probe/Pressure Test Fixture as per table 1.

Control Setting	Position / Reading
Valve #1	Open
Valve #2	Open
Valve #3	Open
Reg #1	Slowly increasing
Gauge #1	53 - 56 psig (3.51 - 3.86 bar)
Gauge #2	Oxygen Source Pressure

Table 1, reference figure 57 & 59

22.6 Slowly increase the pressure (Reg #1) on the Probe/Pressure Test Fixture and stop when you hear the Pressure Relief valve on the EasyMate Portable open, indicated by a hissing sound. The opening pressure of the Pressure Relief Valve should be between 53 - 56 psig (3.51 - 3.86) as indicated on test pressure gauge (Gauge #1), record relief pressure. If pressure is outside of this range replace the Pressure Relief Valve as per section 3.0.

22.7 Close the Pressurization Valve (Valve #2) on the Probe/Pressure Test Fixture and allow the pressure to stabilize for 5 to 10 seconds as indicated on the Test Pressure Gauge (Gauge #1). The Pressure Relief Valve reset pressure should be between 51 - 53 psi (3.51 - 3.65 bar) Record reset pressure. If pressure is outside of this range replace the Pressure Relief Valve as per section 3.0

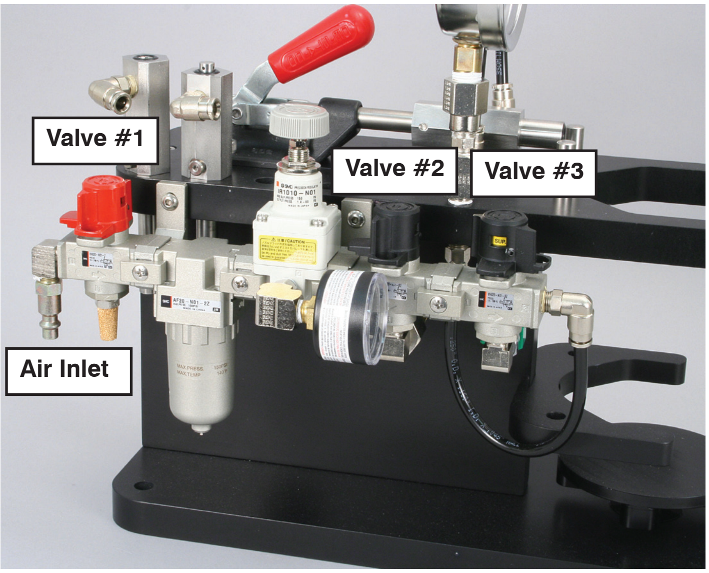


Figure 57

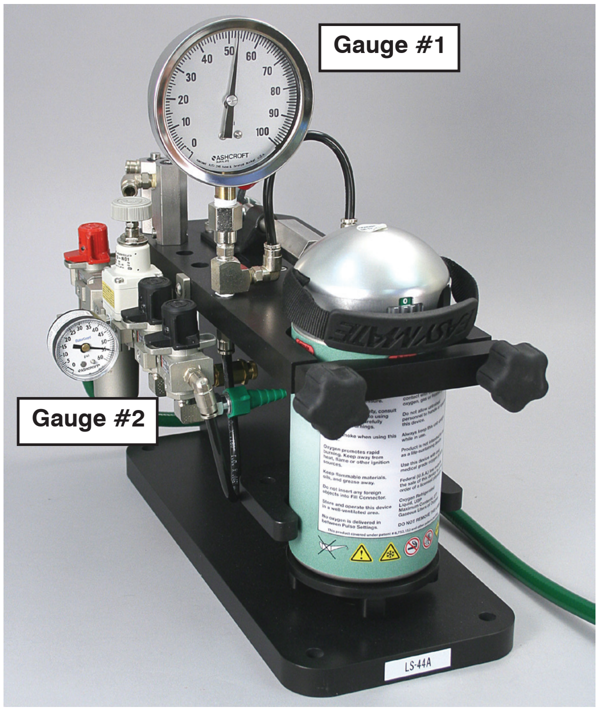


Figure 58

Leak down test

22.8 Set the controls on the Probe/Pressure Test Fixture should be as per table 2.

Control Setting	Position / Reading
Valve #1	Open
Valve #2	Closed
Valve #3	Open
Reg #1	Slowly increasing
Gauge #1	Above 45 psig (3.1 bar)
Gauge #2	N/A

Table 2, reference figure 57 & 59

22.9 Monitor the pressure on Test Pressure Gauge (Gauge #1) on the Probe/Pressure Test Fixture for an additional 30 seconds, the pressure should not drop below **45 psi (3.10 bar)**, this is the leak-down pressure test, record leak down pressure. If the pressure is below 45 psi (3.10 bar) check for leaks.

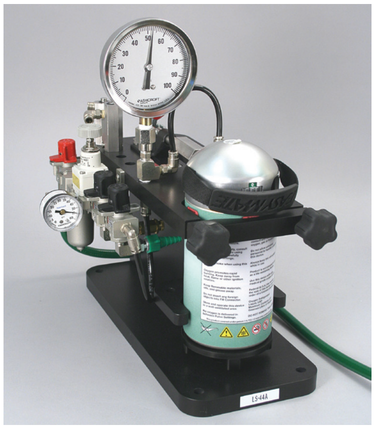


Figure 59

TEST INSTRUCTIONS (continued)

Section 23.0 Fill Connector, (all models)

P-B Fill Connector

23.1 Fill the EasyMate Portable as per User Manual from a LOX source. During the fill process, observe for any LOX leaking from Fill Connectors particularly from the Lip Seal. If leakage is found replace Lip Seal, see section 20.0 - 21.0.
23.2 Once filled release Vent-to-Fill Lever and after 3 - 5 seconds disengage the EasyMate Portable from the base unit.
23.3 Wait 15 seconds and inspect for any LOX or GOX leaking from Fill Connector Poppet. If leakage is found replace Fill Connector Poppet Assembly as per section 20.0 - 21.0.

Mark Series Fill Connector

23.4 Inspect pin on the fill connector for damage or signs of wear. If damage or wear is found replace Fill Connector as per section 20.0 - 21.0.
23.5 Fill the EasyMate Portable as per User Manual from a LOX source. During the fill process observe for any LOX leaking from Fill Connector. If leaking is found replace Fill Connector as per section 20.0 - 21.0.
23.6 Once filled, release Vent-to-Fill Lever and after 3 - 5 seconds disengage the EasyMate Portable from the base unit.
23.7 After 15 seconds inspect for any LOX or GOX leaking from Fill Connector Poppet. If leakage is found replace Fill Connector Poppet Assembly as per section 20.0 - 21.0.

Caire Fill Connector

23.8 Inspect pin on the fill connector for damage or signs of wear. If damage or wear is found replace Fill Connector as per section 20.0 - 21.0.
23.9 Fill the EasyMate Portable as per User Manual from a LOX source. During the fill process, observe for any LOX leaking from Fill Connector. If leaking is found replace Fill Connector as per section 20.0 - 21.0.
23.10 Once filled, release Vent-to-Fill Lever and after 3 - 5 seconds disengage the EasyMate Portable from the base unit.
23.11 After 15 seconds inspect for any LOX or GOX leaking from Fill Connector Poppet. If leakage is found replace Fill Connector Poppet Assembly as per section 20.0 - 21.0.

Taema Fill Connector (European Market)

23.12 Fill the EasyMate Portable as per User manual from a LOX source. During the fill process, observe for any LOX leaking from Fill Connectors particularly from the Lip Seal. If leaking is found replace Lip Seal, see section 20.0 - 21.0.
23.13 Once filled, release Vent-to-Fill Lever. After 3- 5 seconds, disengage the EasyMate Portable from the base unit.
23.14 After 15 seconds inspect for any LOX or GOX leaking from Fill Connector Poppet. If leakage is found replace Fill Connector Poppet Assembly as per section 20.0 - 21.0.

Section 24.0 Vent-to-Fill Valve , refer to figure 6

24.1 During the fill process observe for LOX leakage around the Vent-to-Fill lever. Replace the Vent-to-Fill Valve if leakage is found as per section 4.0.
24.2 Insure that the Vent-to-Fill Lever opens and closes smoothly. If the Vent-to-Fill Valve does not move smoothly, replace as per section 4.0.
24.3 If after 5 minutes GOX continues to leak from vent tube replace the Vent-to-Fill Valve as per section 4.0.

TEST INSTRUCTIONS (continued)

Section 25.0 Probe Assembly Test, refer to figure 60

25.1 Insure that the Pulse Selector in set to setting “0”.

25.2 Fill unit with LOX as per User manual and allow to stabilize for a minimum of 30 minutes.

25.3 Install unit to the Probe/Pressure Test Fixture, attach and engage the appropriate fill connector adaptor.

25.4 Set the Probe/Pressure Test Fixture controls as per table 3.

Control Setting	Position / Reading
Valve #1	Closed
Valve #2	Closed
Valve #3	Closed (Bleed)
Reg #1	Slowly increasing
Gauge #1	42 - 50 psig (2.90 - 3.45 bar)
Gauge #2	N/A

Table 3, reference figure 60

25.5 Allow the unit to remain in the Probe/Pressure Test Fixture for a minimum of 15 minutes. The Probe Test Pressure should be between 42 - 50 psi (2.90 - 3.45 bar), record data.

25.6 If the Probe Test Pressure is above 50 psi (3.45 bar) test the NER as per section 26.0. If the pressure is still above 50 psig (3.45 bar) replace the Probe Assembly as per section 14.0 - 15.0.

25.7 If the Probe Test Pressure is below 42 psi (2.90 bar) check for leaks as per section 22.0 - 24.0. If still low check the Probe Diaphragm for failure, replace as necessary as per section 13 or replace the Probe assembly as per section 14.0 - 15.0.

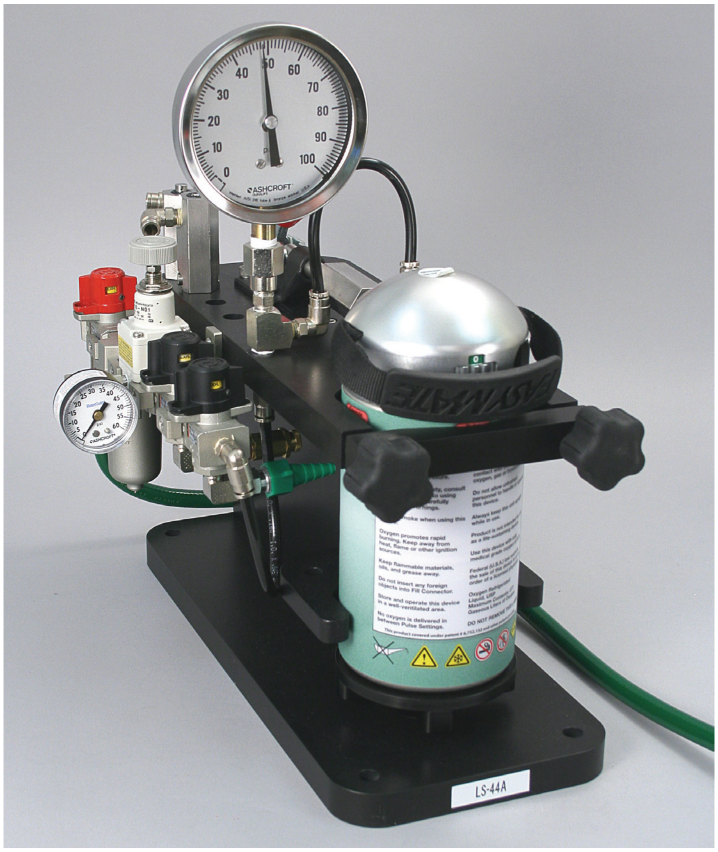


Figure 60

TEST INSTRUCTIONS (continued)

Section 26.0 NER Test , refer figure 61

26.1 Insure EasyMate Portable has passed the Pressure Relief Valve/Leak-down tests from section 22.0 - 24.0 prior to performing the NER Test.

26.2 Ensure the Pulse Selector is set to setting “0”.

26.3 Fill the EasyMate Portable as per User manual with LOX and allow stabilization for a minimum of 90 minutes.

26.4 Weigh the unit on a calibrated weight scale and record time and weight.

26.5 Wait 60 minutes, weigh the unit again and record time and weight.

NOTE: Care must be exercised when moving the EasyMate Portable on and off the scale and during the wait period. Any agitation or unnecessary movement can cause a false NER test result.

26.6 Calculate the NER by using the following formula:

$$\frac{\text{Weight Change (ounces)}}{\text{Elapsed Time (hours)}}$$

26.7 Confirm that the NER is **1.53 ounces/hour (43.38 grams/hour) [or in flow 0.55 lpm] or less.** If the unit’s NER is above 1.53 ounces/hour (43.38 grams/hour) repeat steps 26.1 - 26.7. If the NER is still above 1.53 ounces/hour (43.38 grams/hour) test the Probe Assembly as per section 25 and replace as necessary as per 14 - 15. If the NER is still high and the Probe Assembly is functioning properly, replace the Cryogenic Container as per section 16.0 - 17.0.

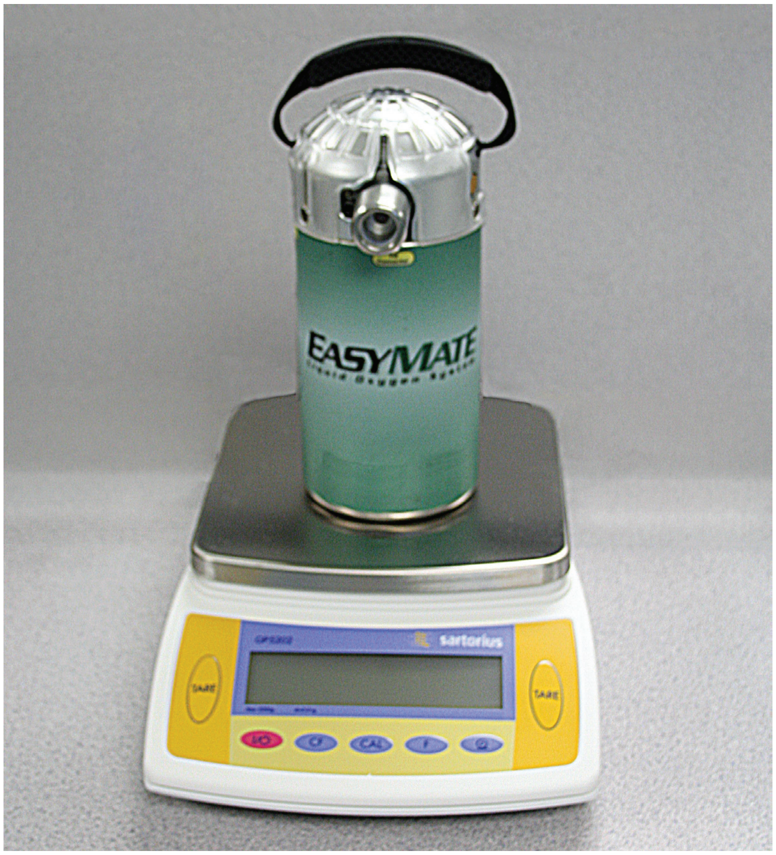


Figure 61

TEST INSTRUCTIONS (continued)

Section 27.0 Trigger sensitivity setting and Test , refer figure 62

NOTE: This procedure must be performed whenever the EasyMate has been disassembled.

27.1 Insure that the Sensitivity Setting Spring and Sensitivity Adjustment Screw have been installed into the Dome and NOT secured with thread locking compound.

27.2 Set the EasyMate to setting "0" and fill as per the User Manual and allow it to stabilize for 15 minutes. This allows the unit to reach full relief pressure indicated by the Pressure Relief Valve venting pressure.

27.3 Place the EasyMate into the Probe/Pressure Test Fixture and secure.

27.4 Attach the appropriate fill connector adaptor to Probe/Pressure Test Fixture and engage into Fill Connector.

27.5 Set the Pressure Test Fixture controls as per table 4, insure that its pressure is within **50 - 56 psi (3.45 - 3.86 bar).**

Control Setting	Position / Reading
Valve #1	Closed
Valve #2	Closed
Valve #3	Open
Reg #1	Slowly increasing
Gauge #1	50 - 56 psig (3.45 - 3.86 bar)
Gauge #2	N/A

Table 4, reference figure 62

27.6 Set the EasyMate Pulse Selector to setting "1", if it pulses on its own (auto cycle) as indicated by the flow indicator, slowly turn the Sensitivity Adjustment Screw clockwise (in) until the pulsing stops, **OR…**

27.7 If the EasyMate does not pulse on it own turn the Sensitivity Adjustment Screw counterclockwise (out) until it begins to pulse on its own (auto pulse) as indicated by the flow indicator, **NOW…**

27.8 **Slowly** turn the Sensitivity Adjustment Screw clockwise (in) until the pulsing just stops.

NOTE: The objective is to find the point where the auto pulsing just stops. You may slowly turn the Sensitivity Adjustment Screw counterclockwise (out) a ½ turn or so and then clockwise again to find the exact point where auto cycling stops.

27.9 Now turn the Sensitivity Adjustment Screw in an additional ½ turn beyond the point were the auto pulsing stops. This should be the final set point.

27.10 Connect the CTS to appropriate power source and 50 psi +/- 10% (3.45 bar +/- 10%) compressed air source.

27.11 Turn on the CTS and insure that the CTSs system pressure is set within specified range.

27.12 Set the CTS to 20 breaths per minute (BPM).

27.13 Attach the tubing from the CTS to the Outlet Fitting on the EasyMate.

TEST INSTRUCTIONS (continued)

27.14 The EasyMate should deliver a pulse with each ‘breath’ or cycle from the CTS. If it fails to pulse on every breath repeat steps 27.5 - 27.13.

27.14 Insure that the EasyMate triggers on each ‘breath’ from the CTS on settings 2, 3 and 4 as well, if not repeat steps 27.5 - 27.13.

27.15 With the EasyMate on setting “1” slowly remove the tubing form the Outlet Fitting. There should be no auto cycles with in 30 seconds.

NOTE: Be aware that any small abrupt change in ambient pressure in proximity to the EasyMate, may cause an auto cycle (i.e. the room door opening or closing, a breeze from a fan, removing the tubing from the Outlet Fitting to quickly etc.).

27.16 Apply a small drop of the Loctite 222MS Thread Locking Compound around the Sensitivity Adjustment Screw.

NOTE: DO NOT apply thread locking compound into the hex socket of the Sensitivity Adjustment Screw. This will make future removal difficult.

27.17 Apply a new Dome Logo label covering Sensitivity Adjustment Screw.

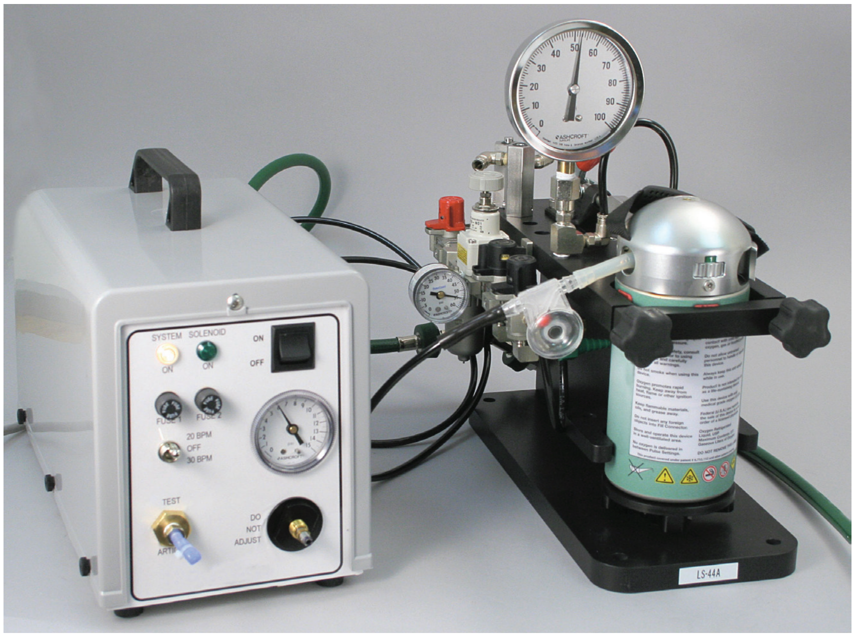


Figure 62

Section 28.0 Conserver performance Test (optional) , for reference only!

28.1 XXXXXXXXXXXXX’s Oxygen Conserving Technology which is incorporated in the EasyMate is unique. It controls the total amount of oxygen delivered to the patient per minute, referred to as Minute Volume Control or Fixed Minute Volume Control. This Technology is inherently accurate so performance tests of the conserver are not necessary. Therefore this section is for informational use only and is not required to verify the performance of the EasyMate.

28.2 Connect Probe/Pressure Test Fixture Model LS-45 to a compressed oxygen source of **70 to 100 psi (4.82 - 6.89 bar)** via its inlet fitting.

28.3 Place the unit into Probe/Pressure Test Fixture and secure.

28.4 Attach the appropriate fill connector adaptor to Probe/Pressure Test Fixture and engage into Fill Connector.

TEST INSTRUCTIONS (continued)

28.5 Ensure that the EasyMate is set to setting “0”.

28.6 Set and observe the controls on the Probe/Pressure Test Fixture as per the table 5:

Control Setting	Position / Reading
Valve #1	Open
Valve #2	Open
Valve #3	Open
Reg #1	As set
Gauge #1	51 - 53 psig (3.51 - 3.65 bar)
Gauge #2	N/A

Table 5, reference figure 62

28.7 Increase regulator pressure (Reg #1) on the Probe/Pressure Test Fixture until the pressure reaches between **51 - 53 psig (3.51 - 3.65 bar).**

28.8 Connect the CTS to appropriate power source and 50 psi +/- 10% (3.45 bar +/- 10%) compressed air source.

28.9 Turn on the CTS and insure that the CTSs system pressure is set within specification range.

28.10 Set the CTS to 20 breaths per minute (BPM).

28.11 Attach the tubing from the trigger port of the CTS to the Outlet Fitting on a Mass Flowmeter capable of measuring minute volume (the sum of one minute’s pulses).

28.12 Connect the other end of the Mass Flowmeter to the outlet fitting of the EasyMate.

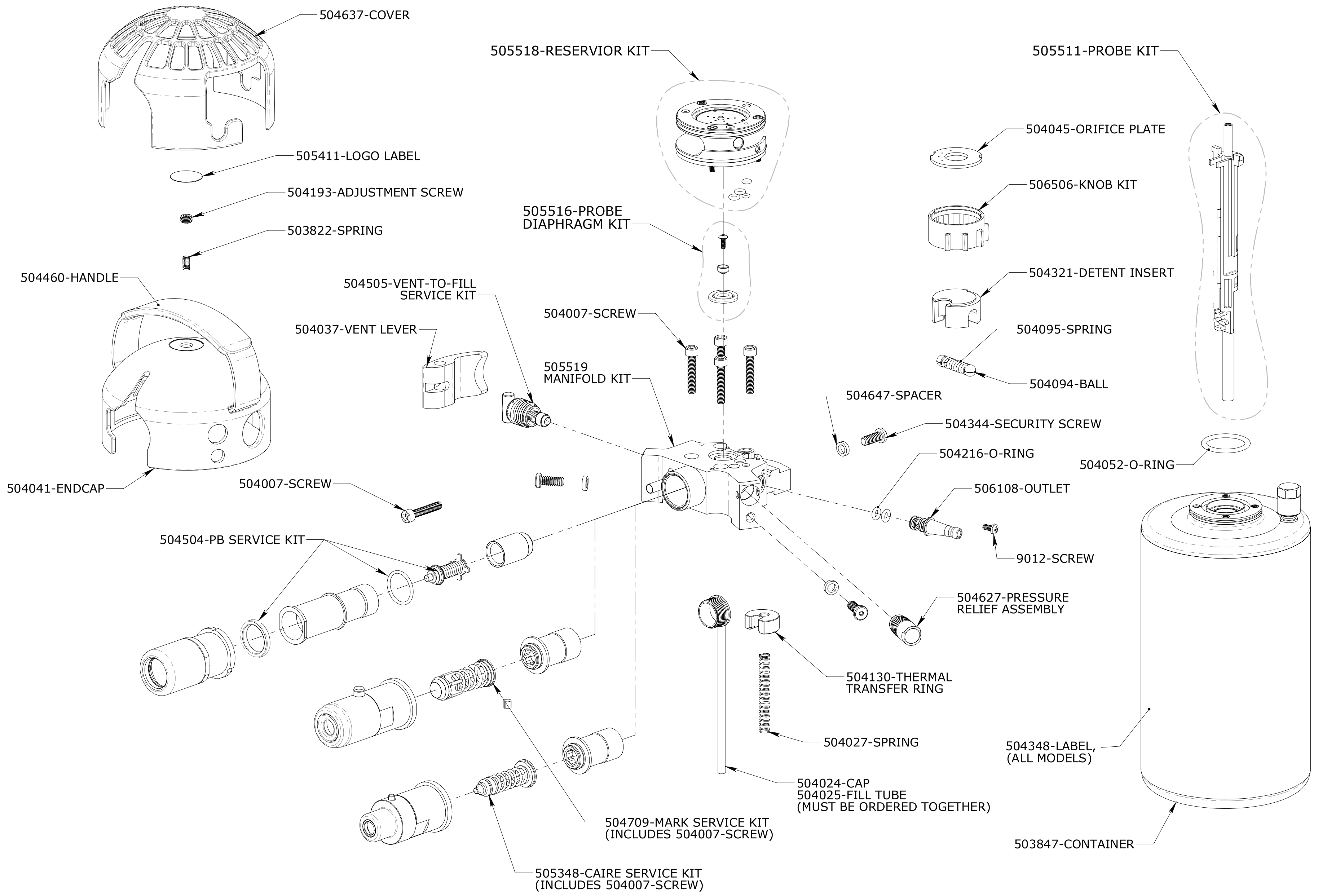
28.13 The EasyMate should deliver a pulse with each ‘breath’ or cycle from the CTS. If it fails to pulse on every breath refer to section 27.0.

28.14 The Minute Volume at 20 BPM of each setting are as indicated on the table 6:

Setting	Minute Reading*
1	360
2	460
3	580
4	700

Table 6, for reference only, not a specification
***+/- 15%**

NOTE: This above data is not a performance specification and is for reference use only. There are many variables that can effect the results of this test including but not limited to; type and brand of mass flowmeter, resistance in test circuit, breath rate, calibration of test equipment, dead space in test circuit, resistance in mass flowmeter etc.


504637-COVER
505518-RESERVIOR KIT
505511-PROBE KIT
504045-ORIFICE PLATE
505411-LOGO LABEL
506506-KNOB KIT
504193-ADJUSTMENT SCREW
505516-PROBE DIAPHRAGM KIT
503822-SPRING
504321-DETENT INSERT
504460-HANDLE
504505-VENT-TO-FILL SERVICE KIT
504007-SCREW
504037-VENT LEVER
504095-SPRING
505519 MANIFOLD KIT
504094-BALL
504647-SPACER
504344-SECURITY SCREW
504216-O-RING
504052-O-RING
504041-ENDCAP
504007-SCREW
506108-OUTLET
504504-PB SERVICE KIT
9012-SCREW
504627-PRESSURE RELIEF ASSEMBLY
504130-THERMAL TRANSFER RING
504027-SPRING
504348-LABEL, (ALL MODELS)
504024-CAP
504025-FILL TUBE
(MUST BE ORDERED TOGETHER)
504709-MARK SERVICE KIT (INCLUDES 504007-SCREW)
503847-CONTAINER
505348-CAIRE SERVICE KIT (INCLUDES 504007-SCREW)